STUDY TO EVALUATE THE IMPACT OF COMPREHENSIVE INTERVENTIONAL PACKAGE TO IDENTIFY THE RISK OF VENTILATOR ASSOCIATED PNEUMONIA AMONG VENTILATED PATIENTS

BY

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A dissertation submitted to the Tamil Nadu Dr. M.G.R. Medical University, Chennai,

In partial fulfilment of the requirements for the degree of Master of Science in

Medical Surgical Nursing

UNDER THE GUIDANCE OF

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Madurai- 4.

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October – 2016

CERTIFICATE

This is to certify that the dissertation entitled "**Study to evaluate the impact of comprehensive interventional package to identify the risk of ventilator associated pneumonia among ventilated patients in selected hospital, Madurai"** is a bonafide work done by **D.DEEPAK STEPHEN,** C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Health Sciences, Madurai, submitted in partial fulfilment for the degree of Master of Science in Nursing.

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CERTIFICATE BY THE EXAMINERS

This is to certify that the dissertation entitled "**Study to evaluate the impact of comprehensive interventional package to identify the risk of ventilator associated pneumonia among ventilated patients in selected hospital, Madurai"** is a bonafide work done by **D.DEEPAK STEPHEN,** C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Health Sciences, Madurai, submitted in partial fulfilment for the degree of Master of Science in Nursing from the Tamil Nadu Dr.M.G.R. Medical University, Chennai.

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"He (GOD) will fill your mouth with laughter; shouts of Joy will come from your lips"

- Bible (Job:8:21)

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ABSTRACT

INTRODUCTION

Ventilator Associated Pneumonia (VAP) is one of the common nosocomial infections in ICU. VAP is the second leading cause of morbidity and mortality in the intensive care unit after urinary tract infection. The incidence of VAP was 86% and mortality rates exceed 59%. Once the patient has developed VAP, additional requirement of treatment increases the length of stay by up to 22 days and raise the cost of care. 86% of nosocomial pneumonia was associated with intubation and mechanical ventilation.

STATEMENT OF THE PROBLEM

A Study to evaluate the impact of comprehensive interventional package to identify the risk of ventilator associated pneumonia among ventilated patients in selected hospital, Madurai.

OBJECTIVES

Objectives of the study were to;

1. To assess the risk of ventilator associated pneumonia before and after implementation of comprehensive interventional package among patients in control and experimental group.
2. To determine the impact of comprehensive interventional package on ventilator associated pneumonia risk by comparing pre-test and post-test scores among control and experimental group.
3. To determine the impact of comprehensive interventional package on ventilator associated pneumonia risk by comparing post-test scores between the control and experimental group.

4. To find out the association between the risks of ventilator associated pneumonia among ventilated patients with their selected demographic and clinical variables in control and experimental group.

MATERIAL AND METHODS

In this study, quasi experimental pre-test post-test control group design was adopted. The researcher has chosen two hospitals which include Vadamalayan hospital and Velammal medical college hospital from Madurai, Tamil Nadu as experimental group and control group respectively for the present study. The sample comprised of 60 ventilated patients at selected hospitals in Madurai, among which 30 patients were assigned in the control group and 30 patients were in the experimental group. The samples were recognized based on the inclusion criteria and selected by convenience sampling technique. Risk assessment tool for VAP was used as a tool for data collection after confirming validity and reliability. Comprehensive interventional package was implemented on the experimental group only. The data obtained was analyzed and interpreted using descriptive and inferential statistics.

RESULTS

The score of the modified clinical pulmonary score for risk of ventilator associated pneumonia were compared within the groups. The findings revealed that, In the experimental group, Out of the total 30 patients after the implementation of comprehensive interventional package, in the pre-test majority of the patient 27 (90%) had mild risk, 3 (10%) had no risk and none had moderate or high risk. Whereas in the post-test-1 most of the patients 24 (80%) had mild risk, 2 (6.66%) had no risk, 4 (13.33%) had moderate risk and none had high risk. Similarly in the post-test-2 majority of patients 24 (80%) had mild risk, 3 (10%) had moderate risk, 3

(10%) had no risk and none had high risk. The risk of Ventilated Associated Pneumonia risk score in pre-test was 1.83, post-test-1 was 2.3 and the post-test-2 was 2.13. The paired 't' test for the risk of ventilated associated pneumonia was 3.58, 1.8 and 8.136, which shows there is no raise in the risk of Ventilated Associated Pneumonia in the pre-test, post-test-1 and post-test-2 among experimental group after the implementation of comprehensive interventional package.

Whereas in the control group, Out of the total 30 patients, in the pre-test relatively a high proportion of the patients 27 (90%) had mild risk, 3 (10%) had no risk and none of them had moderate or high risk. Whereas in the post-test-1 majority of the patient 16 (53.33%) had moderate risk, 14 (46.66%) had mild risk and none of them had no risk or high risk. Whereas in post-test-2 most of the patient 18 (60%) had moderate risk, 6 (20%) had high risk, 6 (20%) had mild risk and none of them had no risk.The risk of Ventilated Associated Pneumonia risk score in pre-test was 1.73, post-test-1 was 3.23 and the post-test-2 was 25.36. The paired 't' test for the risk of ventilated associated pneumonia was 7.14, 7.56 and 5.38, which shows there is raise in the risk of Ventilated Associated Pneumonia in the pre-test, post-test-1 and post-test-2 among control group without the implementation of comprehensive interventional package.

It can be interpreted that the risk of ventilator Associated Pneumonia has not increased in the experimental after the implementation of comprehensive interventional package.

Regarding the impact of comprehensive interventional package, the mean score for post-test-2 was lower than the mean score for post-test-1. It was 2.3 in the post-test-1 and 2.13 in the post-test-2. The paired 't' test for the risk of Ventilator Associated Pneumonia was 5.38 ($p<0.001$), which was highly significant. The independent 't' test was 8.136 ($p<0.001$), which was highly significant. This was statistically proven that the impact of comprehensive

interventional package on risk of Ventilator Associated Pneumonia was effective among mechanically ventilated patients.

Regarding association between the pre-test risk of Ventilated Associated Pneumonia with the selected socio-demographic and clinical variables, there is no significant association between the risk of Ventilator Associated Pneumonia with the selected socio-demographic and clinical variables.

DISCUSSION

In this study the risk of ventilator associated pneumonia among mechanically ventilated patients was assessed and it showed that the ventilated clients are at high risk for developing ventilator associated pneumonia. Comprehensive interventional package was used as a means for preventing the risk of ventilator associated pneumonia among ventilated patients. Thus, the finding of this study provides an empirical evidence to prove that the implementation of comprehensive interventional package is a good method to prevent the risk of Ventilator Associated Pneumonia among the mechanically ventilated patients.

CONCLUSION

The study results reveal that, there is significant difference in the risk of ventilator associated pneumonia in experimental and control group. The study concluded that the implementation of comprehensive interventional package was effective in preventing the risk of ventilator associated pneumonia among mechanically ventilated patients.

INDEX

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

CHAPTER I

INTRODUCTION

"An ounce of prevention is worth a pound of cure"

- Benjamin Franklin

BACKGROUND OF THE STUDY

The health care providers and patient face multiple challenges, where new treatment modalities and technology interfere with the continuing efforts to strive for quality care and expected outcomes. Efficiency and cost effectiveness must go hand in hand, to satisfy the patients and to improve the quality of care. While encouraging the innovations, it makes a sense; their drastic effects need to be screened.

Ventilator Associated Pneumonia (VAP) is one of the common nosocomial infections in ICU. VAP is the second leading cause of morbidity and mortality in the intensive care unit after urinary tract infection. The incidence of VAP was 86% and mortality rates exceed 59%. Once the patient has developed VAP, additional requirement of treatment increases the length of stay by up to 22 days and raise the cost of care. 86% of nosocomial pneumonia was associated with intubation and mechanical ventilation. The most frequent isolates from pneumonia were Gram-negative aerobic organisms (64%) such as Pseudomonas Aeruginosa (21%) and Acinetobacter (18%). Staphylococcus aureus (20%) was also isolated with similar frequency, among hospitalized patients in United States (Mehta et al. 2003).

According to global statistics, 8.7% of patients with Hospital acquired infection has mortality rate as high as 50%. Ventilator associated pneumonia is the most common Hospital

acquired infection among mechanically ventilated patients worldwide, is a major clinical concern, associated with high incidence rates, mortality and costs in Europe, United states, and Asia. Ventilator associated pneumonia rates range from 9-40%, and as high as 78%.

The incidence of VAP in ICU is 18.7 per 1000 days of mechanical ventilation. Ventilator associated pneumonia occurs in 9 to 27% of all intubated patients and 28 to 40% of brain injury in ventilated patients develops due to this condition. Ventilator associated pneumonia occurs up to 17 times more frequently in developing countries than elsewhere and has a mortality rate as high as 27%, among all other infections. The risk of VAP is higher during early course of hospital stay. It is estimated to be 3% during first 5 days, decreasing to 2% during 5 to 10 days of mechanical ventilation and to 1% afterwards. Among hospital acquired infections VAP is the leading cause of death, exceeding the rate of death due to central line infection, severe sepsis, and respiratory infection in the non-intubated patients. Hospital mortality of ventilated patients who develop VAP is 46%, in comparison with 32% of ventilated patients who do not develop VAP.

According to Indian statistical analysis, Ventilator associated pneumonia was 24 out of 51 cases. The mortality in the Ventilator Associated pneumonia group was 37%. The incidence of ventilator associated pneumonia was 8.3% of the total number of patients on ventilator support. The data summary for 1992-2004 from the National Nosocomial Infections Surveillance System report reveals a medium ventilator associated pneumonia rate 2.2 to 14.7 cases per 1000 patient days of mechanical ventilation in adult ICUs.

The development of sophisticated technology, support and elaborate medical interventions, which help many patients to walk out of the hospital, which was unimaginable a

few decades back. In order to gain maximum benefits out of advanced technologies, it is mandatory for the health care professionals to follow standard guidelines to prevent nosocomial infections.

The prevalence of nosocomial infection is higher in Intensive Care Units (ICU) than in the general hospital wards. Catheter related infections, Ventilator Associated Pneumonia and surgical site infections cause the majority of these nosocomial infections. Nosocomial infection increases the mortality, morbidity and cost. The length of hospital stay, stay in ICU, and duration of mechanical ventilation are higher in those patients. Utilization of invasive devices in the major risk factors for the development of nosocomial infections in ICUs warrants the support of invasive devices. Adherence to preventive measures by ICU staff is crucial in reducing nosocomial infections. Implementation of evidence based infection control measures should be the basis for the prevention of nosocomial infection (Rello et al. 2007).

Most episodes of ventilator associate pneumonia (VAP) are developed from the aspiration of oropharyngeal secretions containing potentially pathogenic organisms. Aspiration of gastric secretions may also contribute to the development of VAP, though likely to a lesser degree. Interruption of the body's anatomic and physiology defense against aspiration by tracheal intubation makes mechanical ventilation a major risk factor for VAP. Patients affected with pulmonary infection are economically overburdened in addition to the treatment of the primary condition.

VAP is a preventable secondary consequence resulting from intubation and mechanical ventilation. VAP can be prevented by a combination of intervention which constitutes the VAP bundle. VAP bundle includes head end elevation, hand hygiene, sedation holidays, Deep vein

Thrombosis (DVT) prophylaxis, ulcer prophylaxis and oral care. Novice aspects that can be included in VAP bundle in Subglottic Suctioning. Each aspect of VAP bundle is aimed to prevent the aspiration of secretions containing bacteria into the sterile lower respiratory tract (Mayhall, 2004).

Poor oral hygiene causes the microorganism to colonize in the oropharynx. There is a chance of aspiration of these microorganisms to the lower respiratory tract, causing pneumonia. The chance of aspiration is very high among the patients who are unconscious or semiconscious, intubated and mechanically ventilated. Growth of potentially pathogenic bacteria in dental plaque provides a nidus of infection for microorganisms which result in development of VAP. Dental plaque provides a microhabitat for pathogenic organisms and provides opportunity for adherence either to the tooth surface or to other microorganisms. This microorganism in the mouth gets translocated and colonizes the lung, which can result in VAP.

Removing bacteria from oropharynx requires the removal of dental plaque and proper oral hygiene is the only way to remove plaque. Majority of nurses use a soft toothette instead of tooth brushing and the toothette do not remove plaque as effective as tooth brushes, consequently, oral bacteria can proliferate (Berry at al. 2007).

In normal endotracheal tube there is collection of secretion just above the cuff, which cannot be effectively removed by routine oral suctioning. Amount of secretion pooling above the cuff of endotracheal tube can be minimized by continuous or intermittent aspiration of the secretion which prevent micro aspiration. This can be done by the use of a special endotracheal tube having an additional dorsal lumen called subglottic suctioning port.

Use of continuous aspiration of subglottic secretions in intubated patients reduced the incidence of ventilator associated pneumonia by 43.4%. This decrease was caused by a significant reduction in the incidence of pneumonia during the initial days of mechanical ventilation. Subglottic suctioning represents a simple, inexpensive, and useful approach in the prevention of nosocomial pneumonia. It primarily reduces the risk of pneumonia, caused by indigenous flora already present in the oral cavity of patients at the time of intubation. Furthermore, this measure helps to reduce the antibiotic dosage when combined with other methods of prevention (Lacherade et al. 2010).

VENTILAITOR ASSOCIATED PNEUMONIA

Ventilator-associated pneumonia (VAP) is defined as pneumonia that occurs 48-72 hours of therefore following Endotracheal intubation, characterized by the presence of a new or progressive infiltrate, signs of systemic infection (fever, altered white blood cell count), change in sputum characteristic, and detection of causative agent.

Causes of ventilator associated pneumonia are the Infectious bacteria obtain direct access to the lower respiratory tract via Micro, Pooling and trickling of secretions, and Impairment of mucociliary clearance of secretions. The most important common clinical manifestations of ventilator associated pneumonia are Fever or low body temperature, new purulent sputum, Hypoxemia (decreased amounts of oxygen in the blood) and Respiratory distress

The **preventive measures** include the following:

- Staff education
- Clinical guidelines and care protocols
- Infection prevention and control practice

- Critical care environment
- Staffing pattern
- Intubation precautions
- Positive pressure ventilation
- Pharmacological strategies
- Prevention of aspiration
- Prevention of contamination of equipments
- Prevention of colonization of the aerodigestive tract
- Implementation of VAP bundle
- Surveillance of ventilator associated pneumonia

NEED FOR THE STUDY

Ventilator associated pneumonia is one of the leading cause of mortality and morbidity in critically ill patients. Proper implementation of the prevention protocol is essential in preventing VAP and thereby reducing the economical, personnel and material resources. So the investigator felt the definite need for subglottic suctioning, proper hand hygiene technique, and use of personal protective measures, proper positioning, staff education and developing a modified oral care protocol for intubated patients, in reducing the incidence of ventilator associated pneumonia.

Microbial colonization of the oropharynx and dental plaque has been associated with systemic and respiratory disease, most notably ventilator associate pneumonia (VAP). VAP affects 8% to 28% of patients receiving mechanical ventilation, with mortality rates ranging from 24% to 50%. Mortality rates may be as 7% for infection caused by high risk pathogens such as

pseudomonas or Acinetobacter. Prolonged ICU and hospital stays result in increased costs (Cutler et al. 2005).

Meticulous mouth care is critical in prevention of VAP. The buccal cavity and dental plaque act as perfect media in which bacteria can colonize. 40% to 60% of endogenous lung infections are due to aspirated oropharyngeal secretions. 20% to 40% of these bacteria were staphylococcus aureus, and more than half of them are methicillin resistant (Porzecanski et al. 2006).

Grap et al. (2009) quoted that the bacteria reside in plaque and are transmitted to the lungs via micro aspiration. Dental plaque can be recognized only by tooth brushing. The study demonstrated the tooth brushing is an effective way to reduce the incidence of VAP as it removes the plaque that harbors bacteria.

Aspiration is a potential hazard for the patient with an endotracheal tube. Oral intubation increases salivation and swallowing is difficult, causing pooling of secretion. So proper oral hygiene, frequent oral suctioning and subglottic aspiration is very essential to prevent oral colonization of microorganisms and their transduction to lung tissue.

Nursing education regarding oral care practices for mechanically ventilated patients has comfort rather than a need to promote health. This contributes to the decreased attention, priority and frequency of plaque removal. Hence attention to the oral care of intubated patients using a modified oral care protocol is emphasized.

The development of nosocomial pneumonia depends on the virulence of the bacterial species, the size of inoculation and the capacity of the pulmonary defense mechanism. With the suctioning of subglottic secretions, the volume of oropharyngeal suctions aspirated into the

bronchial tract and the size of inoculation are lowered. Thus continuous aspirations of subglottic secretions in intubated patients reduce VAP episodes.

Manual intermittent aspiration of subglottic secretions shows a decrease in the incidence of ventilator associated pneumonia and a delay in the emergence of pneumonia during mechanical ventilation. Endotracheal tubes used are those with a subglottic suctioning port. Subglottic secretions were aspirated hourly. The intervention represents a simple, inexpensive, and useful approach in the prevention of nosocomial pneumonia (Mahul et al. 2006).

Nurses in critical care unit are required to provide expertise care to patients on ventilator. As patients in critical care unit are confined to bed nurses have to assist or perform various activities of daily living of the patient, until he/she regains his/her independence. Beside ventilator complication of immobility like bed sores, deep vein thrombosis, hypostatic pneumonitis, etc. the nurses thus need to have adequate knowledge patience and empathy for patient's conditions when he/she is on ventilator. An efficient nurse should also see that she/he acts as a liaison between the patients his/her relatives and the health care team members, in order to help the patients to progress towards recover.

As the investigator had been working in the critical care units during his professional career he found that the nurses do carry out the management of patient on ventilator but not up to the required standard resulting in so many complications such as ventilator induced lung injury, ventilator associated pneumonia, respiratory distress syndrome, infection etc. The investigator felt that every nurse should rationalize his/her actions while managing a patient on ventilator.

STATEMENT OF THE PROBLEM

A Study to evaluate the impact of comprehensive interventional package to identify the risk of ventilator associated pneumonia among ventilated patients in selected hospital, Madurai.

OBJECTIVES

Objectives of the study were to;

1. To assess the risk of ventilator associated pneumonia before and after implementation of comprehensive interventional package among patients in control and experimental group.
2. To determine the impact of comprehensive interventional package on ventilator associated pneumonia risk by comparing pre-test and post-test scores among control and experimental group.
3. To determine the impact of comprehensive interventional package on ventilator associated pneumonia risk by comparing post-test scores between the control and experimental group.
4. To find out the association between the risks of ventilator associated pneumonia among ventilated patients with their selected demographic and clinical variables in control and experimental group.

HYPOTHESES

1. There is a significant difference in the pre-test and post-test score among control and experimental group before and after implementation of comprehensive interventional package.

2. The mean post-test score of risk of ventilator associated pneumonia is significantly higher among the ventilated patients in experimental group than the ventilated patients in the control group.
3. There is a statistically significant association between risk of ventilator associated pneumonia with selected demographic and clinical variables in both control and experimental group.

OPERATIONAL DEFINITION

Evaluate the impact

In this study it refers to judge or determine the significance of comprehensive interventional package, and to a way of evaluating changes from comprehensive interventional package on identifying the risk of ventilator associated pneumonia.

Comprehensive interventional package

In this study it refers to the set of interventions used to identify the risk of ventilator associated pneumonia (oral hygiene, Endotracheal suctioning, semi-recumbent positioning, single use equipment, personnel protective measures, staff education and changing ventilator circuit).

Ventilator associated pneumonia

In this study it refers to the pneumonia that develops in intubated patients after 48 hours or more of mechanical ventilator support as assessed by the clinical pulmonary infection score.

Ventilated patients

In this study it refers to those clients who have been intubated with Endotracheal tube for maintaining ventilation and stabilize respiratory parameters.

Selected hospital

In this study it refers to the Velammal Medical College Hospital and Vadamalayan Hospital which is being selected for doing the study and implementing the interventions on the selected patients.

ASSUMPTION

It is assumed that:

- The comprehensive interventional package will reduce the incidence of ventilator associated pneumonia among ventilated patients.
- The risk of ventilator associated pneumonia does not vary with their selected demographic variables.

DELIMITATIONS

- The study is delimited to the risk of ventilator associated pneumonia among ventilated patients in the selected hospital.
- Patients already intubated (more than 12 hours).
- Patients being intubated in other hospital and brought for further management.
- The participants constitute a convenience sampling that may limit transferability of results to other population.

PROJECTED OUTCOME

The findings of the study will help to:

- Identify the impact of comprehensive interventional package.
- Reduce the incidence of ventilator associated pneumonia.

CHAPTER II

REVIEW OF LITERATURE

This chapter deals with the information gathered from various research articles and unpublished thesis, related to the present study. Literature review helps the researcher to strengthen the present study by laying a better foundation and also to mould the study for best outcome. The review for the present study is categorized as follows:

a) Reviews related to incidence of VAP
b) Reviews related to the risk of VAP
c) Reviews related to the prevention of VAP
d) Reviews related to treatment modalities and care for intubated clients

(a) Reviews related to incidence of VAP

Samir Jaber et.al. (2012) conducted a prospective epidemiologic study to identify the risk of ventilator associated pneumonia. Totally 339 patients were selected with severe Acute Respiratory Distress Syndrome (ARDS). During the study period patients with suspected ventilator associated pneumonia underwent bronchoalveolar lavage to confirm the diagnosis. Findings revealed that 98 (28.9%) patients had at least one episode of microbiologically documented ventilator associated pneumonia, including 41 (41.8%) who died in the ICU, compared with 74 (30.7%) of the 241 patients without ventilator associated pneumonia (p=0.05), who received cisatracurium besylate therapy within 2 days of ARDS and decreased the risk of ICU death. Factors independently associated an increased risk to develop ventilator associated pneumonia were male sex and worse admission Glasgow Coma Scale (GCS). The other methods

Tracheostomy, enteral nutrition and the use of a supraglottic secretion-drainage device were protective in patients with severe ARDS. The results revealed that patients who received cisatracurium therapy and other methods were effective in reduction of ventilator associated pneumonia.

Thomas Benet et.al. (2011) conducted a surveillance based study to identify the early onset of ventilator associated pneumonia incidence in ICU. The inclusive criteria were: first ICU admission, not hospitalized before admission, invasive mechanical ventilation during first ICU days, free of antibiotic at admission and ICU stay ≥ 48 hours. Totally, 367 (10.8%) of 3,387 patients were developed ventilator associated pneumonia within first 9 days. The predicted cumulative ventilator associated pneumonia incidence was increased 23.0 (20.8-25.3) at D8. The proportion of missed ventilator associated pneumonia within 48 hours from admission was 11% (9%-17%). This study results shows the underestimation of early-onset ventilator associated pneumonia incidence in ICUs, if only ventilator associated pneumonia occurring ≥48 hours are considered to be hospital-acquired. So clinicians should be encouraged to develop a strategy for early detection of Ventilator associated pneumonia after ICU admission to reduce the ICU mortality.

Palmore et al. (2010) conducted a surveillance based study to determine health care associated infections (HAI) are significant contributors to unnecessary morbidity associated with healthcare delivery in the United States, placing the field of healthcare epidemiology under intense scrutiny. The centers for Disease Control and Prevention (CDC) noted that 1.7 million HAI and nearly 99,000 deaths reported in U.S hospital in 2002, which exceed the number of deaths from any common disease. CDC epidemiologists estimated that 36.3% of these deaths were associated with pneumonia, mainly hospital acquired. The U.S Government Accountability

Office has kept HAI among the top 10 causes of death in the United States. The results revealed that Ventilator Associated Pneumonia (VAP) is a major clinical problem for critically ill and immune compromised patients since they require higher antibiotics, increased length of stay, and increased mortality. A substantial portion of patients who die while hospitalized in intensive care units die with complications, if not of, VAP.

Javier Hortal et.al. (2009) conducted a prospective study to identify the ventilator associated pneumonia in patient's undergone major cardiac surgery. Overall 25 hospitals in 8 different European countries were participated in the study. Patient was selected based on the protocols. The number of patients intervened for major heart surgery was 986. One or more nosocomial infections were detected in 43 (4.4%) patients. Ventilator associated pneumonia was the most frequent nosocomial infection (2.1%; 13.9 episodes per 1000 days of mechanical ventilation). They identified the following significant independent risk factors for ventilator associated pneumonia: ascending aorta surgery [odds ratio (OR) = 6.22; 95% confidence interval (CI) = 1.69 to 22.89), number of blood units transfused (OR = 6.65; 95%, CI = 1.04 to 1.13) and need for reintervention (OR = 6.65; 95%, CI = 2.10 to 21.01)]. The median length of stay in the Intensive care unit was significantly longer ($p<0.001$) in patients with ventilator associated pneumonia than in patients without ventilator associated pneumonia (23 days versus 2 days). Patient's undergone aortic surgery and those with complicated post-intervention, constitute a high-risk group probably requiring more active prevention measure. The results revealed that, increased hospital stay will increase the incidence of Ventilator associated pneumonia.

Luis Camargo.F.A. et.al. (2004) conducted a prospective follow-up study to compare the effectiveness of quantitative and qualitative culture of tracheal aspiration for diagnosed ventilator associated pneumonia. Totally 106 intensive care patients were under ventilator

support. In total, the findings from 219 sequential weekly evaluations for ventilator associated pneumonia were examined. At the same time, cultures of tracheal aspirations were analyzed qualitatively and qualitatively 105 colony-forming units and 106 units. Results revealed that quantitative cultures of tracheal aspirations in selected critically ill patients had decreased sensitivity when compared with quantitative results, and they should not replace the latter to confirm a clinical diagnosis of ventilator associated pneumonia or to adjust antimicrobial therapy.

(b) Reviews related to the risk of VAP

Virginia Bonsal Cooper et.al. (2013) conducted a prospective study on incidence and risk factor for ventilator associated pneumonia in critically ill patients in Canada. Data was collected from 16 ICUs to determine the conditional probability and cumulative risk over the duration of stay in the ICUs. The sample was 1014 mechanically ventilated patients. The results showed that 177 (17.5%) patients developed higher risk for ventilator associated pneumonia, whereas 526 (51.87%) patients developed moderate risk for ventilator associated pneumonia and 311 (30.67%) developed mild risk after the ICU admission.

Christine Ilson et.al. (20010) conducted a study to assess the effectiveness of selective oropharyngeal decontamination significantly reduces the rate of colonization and infection in patients receiving mechanical ventilation for more than 4 days to assess the risk of ventilator associated pneumonia. It suggested that chlorhexidine gluconate rinses for patients in experimental group might be beneficial in reducing bacteria in dental plaque, which may be a source of pathogens for development of ventilator associated pneumonia. The study reveals that out of 50 patients 29(58%) had no risk, whereas 15 (30%) patients developed some risks and 6

(12%) developed high risk for ventilator associated pneumonia. Topically applied antibiotics, or chlorhexidine gluconate rinses may aid in reducing bacteria in mouth, potentially decreasing the risk for ventilator associated pneumonia.

Braine B. Fields et.al. (2009) conducted a prospective study to assess impact of adherence to a ventilator associated pneumonia bundle on the risk of VAP in surgical intensive care unit of Boston Medical Centre in Boston over a 38 month period. A daily checklist was considered complaint if all the items were performed for all patients. Prior to initiation of bundle of VAP was seen at a rate of 10.2 cases per 1000 ventilator days. Compliance with bundle increases over the study period from 53% and 63% to 91% and 81% in each respective SICU. Results revealed that the risk of VAP decreased to 3.4 cases per 1000 ventilator days among clients in interventional group.

Di Chamberlain et.al. (2008) conducted a prospective observational study for one year in the PICU of postgraduate Institute of Medical Education and Research, Chandigarh, to determine the incidence, aetilology and risk factor of ventilator associated pneumonia (VAP). Patients who needed ventilator support, were included and diagnosis of nosocomial was made with regard to CDC guideline. Out of the total 30.5% risk for ventilator associated pneumonia. The study results were concluded that mechanical ventilation was the significant risk factor for development of ventilator associated pneumonia. On multiple regressions analysis re-intubation was the single risk factor for VAP. Overall mortality rate was 21%, and 7% of these deaths were due to ventilator associated pneumonia.

Santiago C et.al. (2002) conducted an experimental study to determine the incidence and risk of ventilator associated pneumonia in trauma ICU. Pressures in the cuffs of the endotracheal

tubes were measured at time of specimen collection and were compared with pressures recorded approximately 6 to 7 hours earlier. A total of 41 observations were made. In 30 instances (73%), the cuff pressure was less than that recorded in the morning. Mean cuff pressure were 21 cm H_2O in the morning and 17 cm H_2O in the afternoon. This difference was significant (paired t test, $p<0.01$). In 8 observation (20%), the pressure were 10 12 cm H_2O less than the morning pressure. These findings are clinically important, because in one study, maintaining the cuff pressure at 20 cmH_2O or higher reduced the risk of VAP. The study findings revealed that maintenance of optimum pressure in cuffs of endotracheal tube reduces the incidence and risk of developing ventilator associated pneumonia.

Shobha Gaikward et.al. (2000) conducted a prospective observational study in NICU of CSM Medical University, Lucknow (UP) to assess aetilology and risk factors of VAP in neonates over a period of one year. Neonates admitted in NICU who required mechanical ventilation for more than 48 hours were enrolled in to the study the study group comprised of 98 neonates out of which, 30 neonates developed VAP (30.6%). VAP rates were 37.2 per 1000 days of mechanical ventilation. Most common bacterial organisms isolated from endotracheal aspirate of VAP patients were Klebsiella spp (32.8%), E coli (23.2%), and Acinobacter (17.8%). Multiple regression analysis revealed that duration of mechanical ventilation (OR 1.10, 95% CI 1.02, 1:21; P=0.021) and very low birth weight (OR 3.88, 95% CI 1.05, 14.34; P=0.042) were two statistically significant risk factors in predicting VAP. Results revealed that very low birth, prematurity, duration of mechanical ventilation, number of reintubations, and length of ICU stay were significantly associated with VAP in bivariate analysis.

(c) Reviews related to the prevention of VAP

Schultz et.al. (2010) conducted an experimental study to determine the impact of establishment of an artificial airway on the risk of contamination of the respiratory tract of critically ill and often immunocompromised intensive care unit patients. Subsequent colonization may lead to ventilator associated pneumonia, a feared and common complication in the ICU setting. Prevention of VAP is extremely important because of its worsening consequences. Preventive measures include but not restricted to, early Weaning, Hand hygiene, Aspiration precautions, and Prevention of contamination (WHAP). The results findings reveled that an educational initiative on WHAP, directed at respiratory care practitioners and intensive unit nurses, was associated with decreases in VAP incidence rates of up to 61%.

Gentile et.al. (2010) conducted a prospective study to determine that prevention of VAP is a multifaceted priority of the intensive care team. Introduction of specialized artificial airway is a milestone in evolving technologies in preventing VAP. The study results suggests that the use of endotracheal tube with a dorsal subglottic lumen, silver – coated and antiseptic – impregnated Endotracheal tubes reduces the incidence of VAP by 50%.

Omrane et.al. (2007) conducted a surveillance study to assess the impact of a protocol incorporated with evidence based interventions, in reducing the frequency and overall rate of VAP. A pre and post intervention observational study was conducted. Mechanically ventilated patients in Montreal General Hospital for duration of one year were included. A multidisciplinary prevention protocol was developed and implemented for all patients. Rate of VAP per 1000 ventilator days were calculated before and after the implementation of the multidisciplinary prevention protocol. Results showed 23 VAP episodes in 925 ventilator-days

during post intervention period (p=0.001). Implementing a VAP prevention protocol incorporated with evidence based guidelines reduced the crude incidence of VAP including early and late onset VAP.

Blot et.al. (2007) conducted an experimental study to assess the knowledge of intensive care unit nurses on evidence based guidelines for the prevention of VAP using a validated multiple choice questionnaire. Among 638 respondents 19% recognized oral intubation as the recommended way for intubation; 49% suggested changing the ventilator circuit for each new patient; 60% respondents recognized subglottic drainage is known to prevent VAP by 90%. The results revealed that, as a whole nurses lack knowledge regarding recommendation for VAP prevention.

Safdar.et.al. (2005) conducted a prospective study to identify the strategies to prevent risk of VAP among mechanically ventilated patients. The strategies to prevent VAP could be better developed only if a sound understanding of pathogenesis and epidemiology exists. The major route for acquiring VAP seemed to be the endogenous flora or by pathogens acquired exogenously from ICU environment (hands or apparel of health team members, contaminated respiratory equipment, hospital water, or air). Apart from that stomach represents a potential site of secondary colonization and reservoir of nosocomial Gram-negative bacilli. Biofilm formation in Endotracheal tube contributes to tracheal colonization and lead to late-onset VAP, after seven days of intubation. VAP results from aspiration of oropharyngeal, gastric and tracheal secretions around cuffed Endotracheal tubes into the sterile respiratory tract. The study result findings conclude that strategies to prevent risk of VAP include oral care, prophylactic aerosolization of antimicrobials, selective aerodigestive mucosal antimicrobial decontamination, stress ulcer prophylaxis and measures to prevent aspiration (VAP bundle with subglottic suctioning).

Epidemic VAP incidence could be zeroed if rigorous disinfection of respiratory equipments and bronchoscopes, and infection control measures were followed strictly.

(d) Reviews related to treatment modalities and care for intubated patients

Speroni.K.G. et.al. (2011) conducted an experimental study to evaluate the effectiveness of continuous aspiration of supraglottic secretion on the prevention of ventilator associated pneumonia in mechanically ventilated patients. Patients with mechanical ventilator were randomly divided into two groups. Continuous aspiration of supraglottic suctioning was performed to experimental group immediately after endotracheal intubation. Results shows, that continuous supraglottic suctioning was effective in reduction of ventilator associated pneumonia.

Garcia et.al. (2009) conducted a quasi experimental study to determine the effect of a comprehensive oral and dental care protocol on the rate of VAP by pre-post interventional study. Adults receiving mechanical ventilation more than 48 hours in Brookdale University Hospital were studied in a two consecutive 24 month periods. Pre-interventional group (n=779) had no oral assessments, no subglottic suctioning, no tooth brushing, and suctioning of secretions in oral cavity as needed. The interventional group (n=759) was treated with a protocol which included oral assessment, deep suctioning every 6 hours, oral tissue cleaning every 4 hours or as needed and tooth brushing twice daily. VAP rate was determined using clinical pulmonary infection score (CPIS) (CPIS>6). The rate of VAP was found to be 12% per 1000 ventilator days before the intervention and decreased to 8.0% per 1000 ventilator days during the intervention (p=0.006). Research study results concluded that the implementation of comprehensive oral care protocol and staff compliance significantly reduced the VAP rate and its associated costs.

Grap.et.al. (2009) conducted a survey on oral care interventions in critical care. Patient's oral care is a component of nursing care. Oral care is often considered primarily an intervention for patient's comfort which may reduce its priority and frequently. Oropharyngeal colonization is associated with several systemic diseases, including cardiovascular disease, chronic obstructive pulmonary disease, and in ICU Ventilator Associated Pneumonia (VAP). VAP occurs in 9% to 24% of patients with various pulmonary disorders. The mortality rate of VAP varies from 54% and 71% and mortality is particularly high in pneumonia attributed to pseudomonas or Acinetobacter. Dental plaque colonized with microbes serve as a reservoir for pathogens in patients with poor oral hygiene. Tooth brushing is effective in reducing number of oral microbes, but it is not routinely performed in ICUs. The lack of published oral care interventions reported by nurses and showed how often these interventions were documented in medical records. The subjects surveyed include 170 nursing care providers and all critically ill patients above 18 years for a period of one month. 75% of respondents reported providing oral care 2 to 3 times per day for none intubated and 72% reported providing oral care more than 5 times per day for intubated patients. Result findings revealed that reported use of toothbrush ($p<001$) for non intubated patients was significantly greater than intubated patients. ICU nurses might be hesitated to provide oral care to intubated patients because ET tubes may limit access to the oral cavity and the fear of tube displacement. These problems can be solved by using a pediatric toothbrush with soft bristles.

Hutchins et.al. (2009) conducted a quality improvement project in Critical Care Unit of spring field medical center based on the findings that VAP develops at a rate of 1% to 3% per day of mechanical ventilation. Mechanically ventilated patients intubated in the study received the modified oral care protocol every 4 hours, tooth brushing with povidine iodine solution using

a suction toothbrush, cleaning oral cavity with hydrogen peroxide swabs, application of a moisturizer and deep oropharyngeal suctioning. The primary efficiency variable, VAP was reduced to 4.12 in December 2005 to 3.57 for 2006 and to 1.3 for 2007, after the inception of the quality improvement project. The study results conclude that the introduction of a modified oral care protocol with ventilator bundle led to 89.7% reduction in VAP rate from 2004 to 2007.

Munro.et.al. (2009) conducted a study to evaluate the effects of mechanical (tooth brushing), pharmacological (topical chlorhexidine), and combination oral care (tooth brushing plus chlorhexidine) in reducing the VAP rate using randomized controlled clinical trial with a 2x2 factorial designs. He enrolled 249 intubated patients within 24 hours of intubation from there ICUs. Patients with clinical diagnosis of pneumonia at the time admission were excluded. Patients were randomized to one of the four treatment group, 0.12% chlorhexidine swab twice daily, tooth brushing thrice daily, both tooth brushing and chlorhexidine, and usual care. Dates were collected using Clinical Pulmonary Infection Score (CPIS). Results proved that chlorhexidine in combination with tooth brushing significantly reduced the incidence of VAP (CPIS<6) by day 3.

Sona.et.al. (2009) conducted a pre-post intervention observational study to determine the effect of a simple low-cost oral care protocol on VAP rate, in 24 bedded surgical ICU of Barnes Jewish Hospital, Mission. All mechanically ventilated patients for a time period of one year were enrolled in the study. The oral care protocol involved tooth brushing and subsequent application 0.12% chlorhexidine gluconate twice daily in 12 hours interval. During pre-intervention period there was 24 infections in 4606 ventilated days (rate=5.2 infections per 1000 ventilator days). There was a reduction in the incidence of infection to 10 in 4158 ventilator days resulting in a lower rate of 2.4 per 1000 ventilator days. There was a statistical significance in this 46%

reduction of VAP (p=0.04). The fewer cases of VAP led to decrease in cost of US $ 1, 40,000 to US $ 5, 60,000 based on estimated cost of VAP. Study result revealed that there was an overall reduction of VAP rate by implementation of a low-cost oral care protocol.

Arabia.Y et.al. (2008) conducted a randomized control trial study to evaluate the rate of ventilation associated pneumonia by using the National Healthcare Safety Network (NHSN). The rates of ventilator associated pneumonia varied from 10 to 41.7% and were gradually higher than NHSM rates. Gram negative bacilli were the most common pathogens, implementation of hand hygiene and ventilation associated pneumonia prevention was practiced to reduced ventilator associated pneumonia. The results revealed that ventilator associated pneumonia was reduced from 94 to 16% after educational program.

Fields.et.al. (2008) conducted an experimental study to assess the effectiveness of VAP bundle on preventing the incidence and risk of VAP. The mechanically ventilated patients in neurologic and other intensive care units are at increased risk of VAP due to decreased level of consciousness, dry open mouth, and micro aspiration of secretions. VAP can be prevented by initiating interventions from the institute of healthcare improvement's (IHI). VAP bundle included, elevating the head end of the bed to 30^0, DVT prophylaxis, gastric ulcer prophylaxis, early mobilization and sedation. The one intervention not included in IHI bundle is oral hygiene. This project aimed at timed tooth brushing combined with VAP bundle in minimizing and preventing the occurrence of VAP. A randomized controlled trial was initiated on a 24-bed ICU with sterile precautions. Nurses were instructed about the importance of oral care and how to do it using a toothbrush with soft bristle. The protocol included using a toothpaste, application of moisturizing agent every 4 hours, oral and pharyngeal suctioning with an enclosed suction catheter, which was disposal of every 24 hours, and inspection of oral cavity every 24 hours. The

results concluded, as the VAP rate dropped to zero within a week of beginning the every 8-hours tooth brushing regimen in the intervention group. The study was too successful that the control group was dropped after 6 months, and all intubated patients were brushed every 8 hours.

Tsai.el.al. (2008) conducted a prospective evaluation of usefulness of intermittent suctioning of oral secretions before each position change in reducing VAP. A time sequence non randomized intervention design was used. After a duration of 9 month observation phase and 6 month education phase, followed by a 7 month intervention phase the occurrence of VAP rate was reduced in studied group (6 of 227 patients, 2.6%) than control group (26 of 237 patients, 11%) ($p<0.001$). The incidence of VAP in control and study group was 6.51 and 2.04 per 1000 ventilated days respectively ($p=0.002$). The results revealed that intermittent suction of oral secretion before each position change proved to be effective in reducing VAP.

Berry.et.al. (2007) conducted a prospective study to determine the impact of proposed oral hygiene as a key intervention for reducing ventilator associated pneumonia. In his study Berry recognized oral hygiene in combination with subglottic suctioning reduces the incidence of VAP from 28% to 9%. The use of a flexible suction catheter during oropharyngeal suctioning reduces the incidence of aspiration. Results revealed that oral hygiene in combination with subglottic suctioning reduced the incidence of VAP.

Lacherade.et.al. (2010) conducted a study to determine the effect of subglottic secretion drainage (SSD) in reducing the incidence of microbiologically confirmed VAP. Patients of four French hospital ICUs, were enrolled in a randomized clinical trial. Among 333 patients 169 were assigned to experimental group, receiving intermittent SSD and 164 in control group not receiving SSD. Occurrence of VAP, using distal pulmonary sampling confirmed VAP in 67

patients, 25 (14.8%) of interventional and 42 (25.6%) of control group (p=0.02). The relative risk reduction was 42.2%. Results finding revealed that, statistically the incidence of both early (1.2%) in interventional and 6.2% in control group (p=0.02), as well as onset VAP (18.6% in interventional and 33.0% in control group [p=0.01]) were reduced by eliminating SSD. The influence of SSD is reducing VAP had been proved.

Bonza.et.al. (2008) conducted a study that compared conventional and continous aspiration of subglottic secretion (CASS) procedure in reducing VAP. A population of 714 patients was randomized as 331 in control group and 359 in CASS group. In mechanically ventilated patients >48 hours the VAP incidence was 26.7% in CASS group and 47.5% in control group (p=0.04); incidence density, 31.5 Vs 51.6 episodes per 1000 days of mechanical ventilation respectively (p=0.03) median length of ICU stay, 7 Vs 16.5 days (p=0.01) respectively. The study results was concluded as CASS is a safe procedure that reduces the use of antibiotics and incidence of VAP in at risk patients and no complications related to CASS were observed.

Depew.et.al. (2007) conducted a surveillance study to assess the effectiveness of endotracheal tube with an aspiration port reduces the incidence and risk of VAP. VAP is a costly complication of hospitalization that lengthens ICU stay, increasing morbidity and mortality. Use of a specialized endotracheal tube with an aspiration port that aspiration subglottic secretion reduces the micro aspiration of colonized secretions into lower airways. Recommendations for VAP prevention by the centers for Disease Control and Prevention, complication during subglottic secretion drainage, and major issues in implementing the use of an endotracheal tube with subglottic port need to be documented. The results revealed that use of a specialized

endotracheal tube with an aspiration port that aspiration subglottic secretion reduces the incidence and risk of VAP.

Neal.O.et.al. (2007) conducted a prospective study to identify the risk of VAP. Aspiration of subglottic secretions plays a major role in the development of VAP with a mortality rate up to 71%. The focus of this study was to find out the optimal suction pressure levels needed to efficiently evacuate subglottic secretions. The effectiveness of suction pressures (20 mm of Hg, 30 mm of Hg, 40 mm of Hg and 50 mm of Hg) needed to maximize evacuation efficiency based on volume and viscosity of subglottic secretions (2ml, 4ml and 6ml) was studied. The result showed that thick secretions had the highest percentage of secretion recovery (83%). Thus study demonstrated that highly viscous secretions are easier to evacuate when the suction pressure applied was 30 mmHg. Removal of subglottic secretion irrespective of its viscosity and amount assist in delaying the development of VAP.

Snodders.et.al. (2002) conducted a study to determine the effect of subglottic secretion drainage on the incidence of VAP in mechanically ventilated patients. A randomized clinical trial was used in a 12 bedded general ICU. 150 patients receiving mechanical ventilation >72 hours were randomized equally to experimental and control group. Homogeneity was minimized in both groups with respect to demographic characteristics and severity of illness. Experimental group were intubated with an Endotracheal tube with intermittent subglottic drainage port and control group were intubated with a standard Endotracheal tube. The outcome variables measured by the researcher were the incidence of VAP, duration of mechanical ventilation, length of ICU and hospital stay and mortality. Using clinical pulmonary infection score (CPIS). VAP rate was diagnosed to be 4% in experimental group and 16% in control group (p=0.014)

and other outcome were not significant. Results concluded that intermittent subglottic drainage was effective in reducing VAP incidence in mechanically ventilated patients.

Shorr et.al. (2001) conducted an experimental study to determine the cost effectiveness of continuous subglottic suctioning (CSS) as a strategy to decrease the incidence of VAP. Decision model analysis of the cost and efficiency of CSS Endotracheal tubes in preventing VAP was used. Estimated models were based on the data from published prospective trails of CSS prospective studies of VAP. Hypothetical cohort of 100 patients requiring nonelective intubation in ICU was the inclusion criteria. The calculated marginal cost effectiveness of CSS was the saving from cases of VAP averted minus additional cost of CSS-ETs, and expressed as cost per episodes of VAP prevented. Despite higher cost of CSS-ETs, a net savings of $4,992 was achieved resulting in $1,924 savings per case of VAP prevented. Research study results revealed that CSS continued to be a better cost effective strategy for VAP prevention.

Kollef et.al. (1999) conducted a randomized clinical trial of continuous aspiration of subglottic secretion (CASS) in 343 cardiac surgery patients in cardiothoracic ICU of Barnes Jewish Hospital, St. Louis. Patients were randomized to receive either CASS or routine postoperative medical care without CASS. Homogeneity maintained in case of demographic characteristics, surgery performed and severity of illness. Results showed the occurrence of VAP was less in experimental group as compared to control group.

CONCEPTUAL FRAMEWORK

The conceptual framework selected for the study was based on Ernestine Wiesenbach's "Prescriptive theory – 1969".

Conceptual framework serves as a spring board for theory development. The conceptual framework for the research study presents the measurement on which the purpose of the proposed study is based. The framework provides the prospective from which the investigator views the problem. The study is designed to assess the effectiveness of comprehensive interventional package on prevention of risk of ventilator associated pneumonia among ventilated patients.

The study is based on the concept that implementation of comprehensive interventional package aids in the prevention of risk of ventilator associated pneumonia. The investigator adopted the Wiesenbach's theory of helping art of clinical nursing 1969 for conceptual framework.

Wiesenbach's prescriptive theory directs action toward an explicit goal. It consists of three factors identification, prescription and realities. A critical care nurse develops a prescription based on identification and implements it according to the realities of the situation.

Ernestine Wiesenbach proposed prescriptive theory for nursing, which is described as conceiving of desired situation and the way to attain it.

According to this theory nursing practice consists of three steps, which include

Step 1: Identifying the need for help.

Step 2: Ministering the needed help.

Step 3: Validating that the need for help was met.

Identifying the need for help

Nurses in patients care tends to find out the needs and problems of the patients and helps them to solve for the better outcome and health improvement. In this study the mechanically ventilated patients needs complete care to aid in better health outcome and prevent complications. The investigator identified that Comprehensive interventional package will be effective in preventing the risk of ventilator associated pneumonia among the mechanically ventilated patients.

Ministering the needed help

For a problem to be solved an intervention has to be given and the needs must be met to by the patient. Ministering care refers to providing needed care or help for the clients. In this study comprehensive interventional package (oral hygiene, Endotracheal suctioning, semi-recumbent positioning, single use equipment, personnel protective measures, staff education and changing ventilator circuit) was ministered to the mechanically ventilated patients to prevent the risk of ventilator associated pneumonia.

Validating that the need for help was met

Validating refers to establishing a soundness, accuracy or legitimacy of the achievement of desired or planed interventional outcome. In this study the investigator evaluated the impact of comprehensive interventional package by using modified clinical pulmonary infection score for preventing the risk of ventilator associated pneumonia. Implementation of comprehensive

interventional package will be effective in preventing the risk of ventilator associated pneumonia among the ventilated patients being exposed to the care.

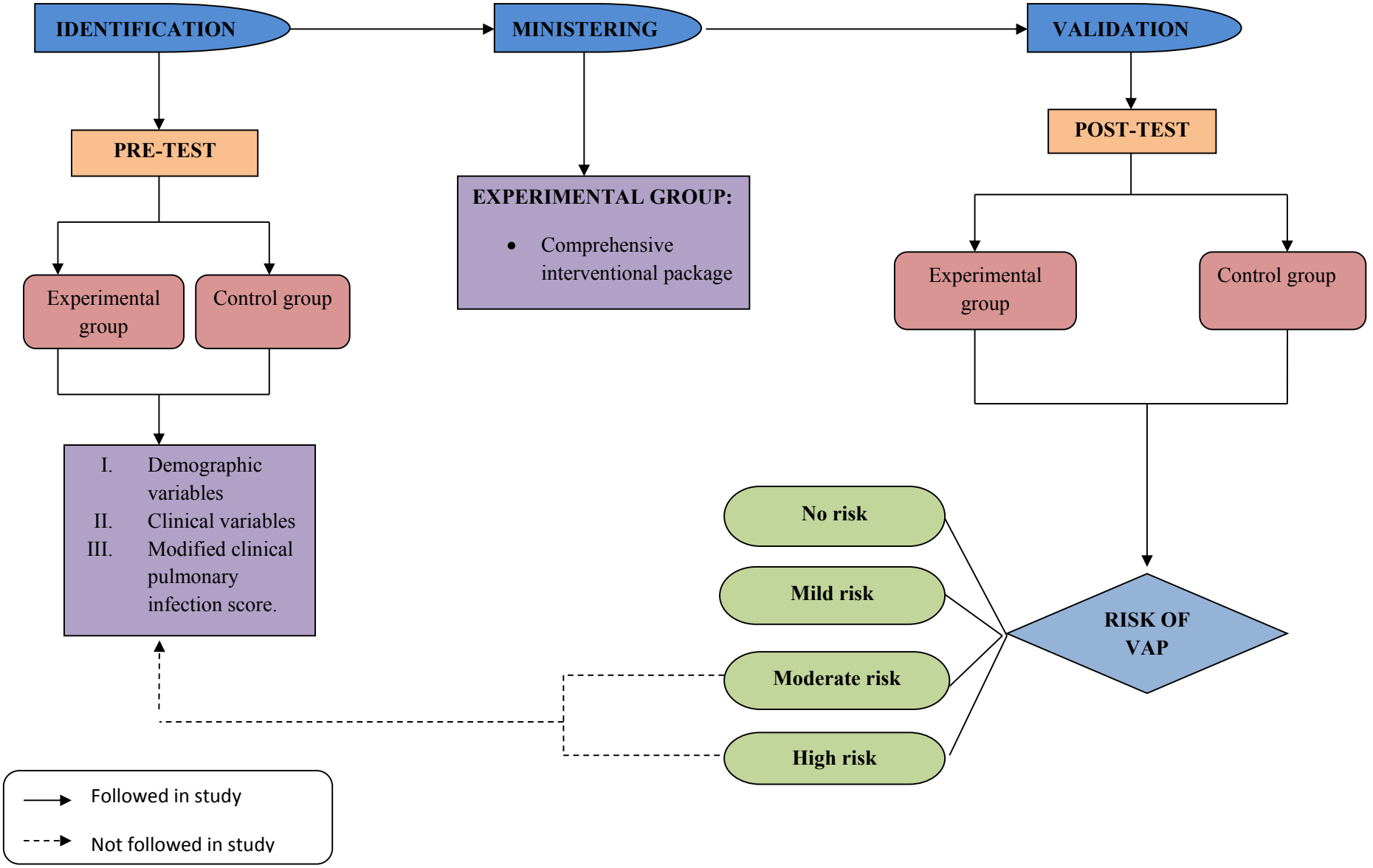


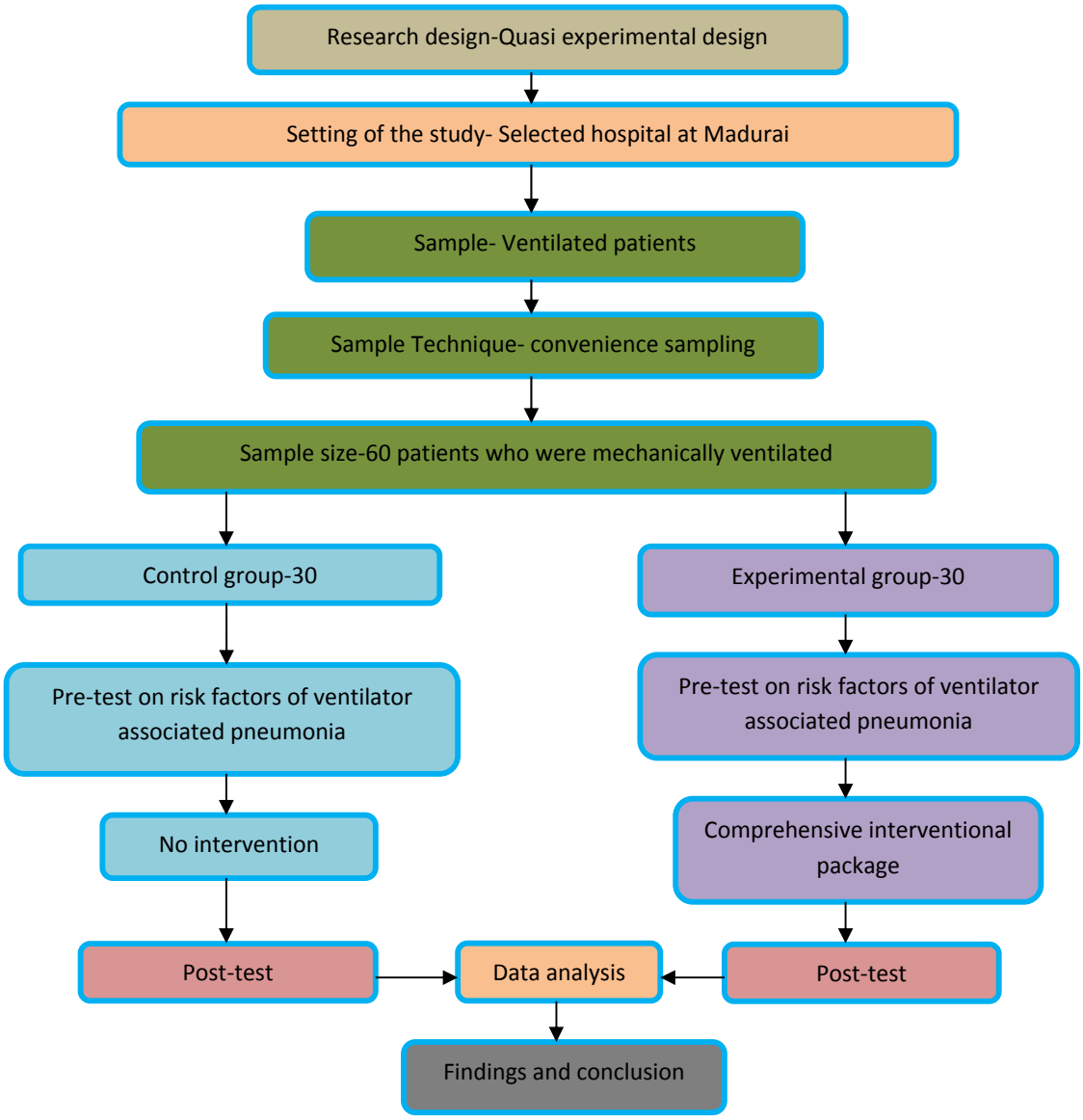
FIGURE: 2.1. CONCEPTUAL FRAMEWORK BASED ON ERNESTEINE WEIDENBACH'S PRESCRIPTIVE THEORY (1969)

CHAPTER III

MATERIALS AND METHODS

It includes the research approach, research design, setting of the study, population, sample and sample size, method of sampling, criteria for sample selection, development and description of the tool validity and reliability of tool, procedure for data collection and plan for analysis, pilot study and ethical consideration.

SCHEMATIC PRESENTATION OF RESEARCH



RESEARCH APPROACH

In order to accomplish the objectives of this study, quantitative approach was adopted to evaluate the impact of comprehensive interventional package to identify the risk of ventilator associated pneumonia among ventilated patients.

RESEARCH DESIGN

In this study, quasi experimental pre-test post-test control group design was adopted to evaluate the impact of comprehensive interventional package to identify the risk of ventilator associated pneumonia among ventilated patients. It is assessed by the notations as:

Experimental group	O_1	X	O_2
Control group	O_1	-	O_2

O_1 – Risk of ventilator associated pneumonia before providing comprehensive interventional package

O_2 – Risk of ventilator associated pneumonia after providing comprehensive interventional package

X – Intervention (comprehensive interventional package)

VARIABLES

The present study has the following variables

Independent variable- comprehensive interventional package

Dependent variable – ventilator associated pneumonia

SETTINGS OF THE STUDY

The researcher has chosen two hospitals which include Vadamalayan hospital and Velammal medical college hospital from Madurai, Tamil Nadu as experimental group and control group respectively for the present study.

Vadamalayan multispecialty hospital, Madurai was selected as the experimental group for the study, which is 13 kilometer from C.S.I Jeyaraj Annapackiam College of Nursing, Pasumalai, Madurai, Tamil Nadu state, South India. It is 300 bedded multispecialty hospital and has health facilities such as casuality, cardio thoracic surgical intensive care unit (CTS-ICU), cardio thoracic operation theatre (OT), medical and surgical wards, post-operative units and maternity unit.

Velammal Medical College Hospital, Madurai was selected as the control group for the present study, which is 15 kilometer from C.S.I Jeyaraj Annapackiam College of Nursing, Pasumalai, Madurai, Tamil Nadu state, South India. It is 1000 bedded medical college hospital and has health facilities such as casualty, cardio thoracic surgical intensive care unit (CTS-ICU), cardio thoracic operation theatre (OT), medical and surgical wards, post-operative unit and maternity unit, pediatric ward and ICUs and psychiatric ward.

POPULATION

Target population - All the ventilated patients in all the hospitals in Madurai district.

Accessible population - Ventilated patients from selected hospitals in Madurai district.

SAMPLE

The samples were the ventilated patients who fulfill the inclusion criteria.

SAMPLE SIZE

The sample comprised of 60 ventilated patients at selected hospitals in Madurai, among which 30 patients were assigned in the control group and 30 patients were in the experimental group.

SAMPLING TECHNIQUE

In the study, convenience sampling technique was used to select the sample. Samples were selected based on sampling criteria.

CRITERIA FOR SAMPLE SELECTION

Inclusion criteria

Patients who were:

- Under mechanical ventilator support
- Patients of both genders
- On first day of mechanical ventilation

Exclusion criteria

Patients who were:

- Non-ventilated patients
- Patients on mechanical ventilator more than 2 days
- Being ventilated from outside hospitals or centers

DESCRIPTION OF THE TOOL

The tool was developed by the investigator with the guidance of the expert's opinion, various resources and review of literature. The tool used for the present study is risk assessment tool for VAP to identify the risk of ventilator associated pneumonia among ventilated patients.

The tool comprised of 2 sections:

Section A - It includes 2 parts

- Demographic variables
- Clinical variables

Section B- Risk assessment tool for VAP

SECTION - A

Part - 1

In this study, demographic variables include age, gender, educational status, occupation, income, marital status. The researcher himself selected the appropriated answers based on client's medical record.

Part - 2

In this study, the clinical variables consisted of personal habits, past history of infection, Glasgow coma scale reading, use of relaxant and sedation, group of antibiotics, administration of prophylactic drug for peptic ulcer, diagnosis, reason for intubation and type and intubation.

SECTION - B

It consists of 10 parameters related to risk of ventilator associated pneumonia, which includes the normal findings and the deviated findings.

SCORING PROCEDURE

SECTION - B

Risk assessment tool for VAP consists of 10 parameters with the normal findings and the deviated findings. The normal finding was rated '0' score and the deviated findings were scored '1'. The score was ranged as follows

Score	**Classification**
0	No infection
1-3	Mild infection
4-8	Moderate infection
9-10	Severe infection

VALIDITY AND RELIABILITY OF THE TOOL

Validity

The present study was validated by 11 nursing and 2 medical experts. They validated the entire section of the tool and evaluated the tool for its clarity, appropriateness, adequacy, relevance and completeness. Few modification and suggestion were made as per the recommendations made by the experts. The tool was refined and finalized after establishing the validity.

Reliability

- The reliability of the tool was elicited by test re-test method using Karl Pearson's correlation coefficient for knowledge was "r"=0.98, which was found to be reliable (Metheney et al. 2010).
- The risk assessment tool for VAP had a sensitivity of 93%, a specificity and positive predictive value of 100% (Davis 2006).
- After the pilot study the tool was found to be reliable and accepted for the study.

PILOT STUDY

The researcher conducted the pilot study in Velammal medical college hospital in Madurai. After obtaining administrative approval from the authorities concerned, the researcher selected 6 patients who were mechanically ventilated. Oral consent was obtained from the ICU in-charge. Out of 6 samples, 3 samples in experimental group and the other 3 samples in control group were selected for the study. Pre-test was carried out for both groups to identify the risk of ventilator associated pneumonia. On the same day after pre-test, samples in experimental group were provided with comprehensive interventional package interventions. Post-test was carried on the 3rd and 5th day by using the same tool. The mean post-test score was higher than the mean pre-test score in experimental group, which confirmed that the conduction of the main study would feasible. It also provided information regarding reliability, feasibility and practicability of the designed methodology.

METHOD OF DATA COLLECTION

The data was collected among mechanically ventilated patients in Vadamalayan multispecialty Hospital, Madurai and Velammal medical college Hospital, Madurai. The period

of data collection was 10 weeks, 60 patients were selected as per above mentioned criteria. Data was collected through relevant demographic variables, clinical variables and modified pulmonary infection score to identify the risk of ventilator associated pneumonia among ventilated patients. The data collection schedule was as follows:

Group	**Period**	**Setting**	**Task**
Experimental	10 weeks	Vadamalayan Multispecialty hospital	Day 1 • Step 1 – orientation to staff • Step 2 – pre-test (0 or 1 day of ventilation) • Step 3 – implementation of comprehensive interventional package Day 3 • Step 4 – post-test- I (3rd ventilator day) Day 5 • Step 5 – Post-test- II (5th ventilator day)
Control		Velammal Medical College Hospital	Day 1 • Step 1 – orientation to staff • Step 2 – pre-test (0 or 1 day of ventilation) Day 3 • Step 3 – post-test- I (3rd ventilator day) Day 5 • Step 4 – Post-test- II (5th ventilator day)

STEPS OF DATA COLLECTION PROCESS

Step 1

- Self introduction to staff members in ICU, recovery units, Emergency.
- Explanation about the purpose of the study to the staff in ICU, recovery unit, Emergency.

Step 2

- Selection of samples and allotment to experimental group and control group based on the inclusion criteria.
- Pre-test for both experimental and control group clients using modified pulmonary infection score.

Step 3

- Implementation of Comprehensive interventional package (oral hygiene, Endotracheal suctioning, semi-recumbent positioning, single use equipment, personnel protective measures, staff education and changing ventilator circuit) for prevention of ventilator associated pneumonia to the patients in the experimental group.
- Routine interventions (endotracheal suctioning, positioning and oral hygiene) to the patients in control group.

Step 4

- Post-test was conducted for both the experimental and control group using the same tool on 3rd and 5th day.
- After the data collection procedure, comprehensive interventional package for prevention of ventilator associated pneumonia was provided to the control group for ethical consideration.
- A hearty gratitude was conveyed to the staff members for their co-operation and participation.

PLAN FOR DATA ANALYSIS

Data analysis helps the researcher to organize, summarize, evaluate, interpret and communicate the numerical facts. For the present study the collected data from the participants were grouped and analyzed using both descriptive and inferential statistical methods. SPSS 16.0 version was used for data analyses.

Study plan to carry out the following analysis:

- Gather all information's obtained from the study tool
- Enter the score in the spreadsheet
- Coding the data

Descriptive statistics

Demographic variables and clinical variables were analyzed using frequency distribution and percentage analysis.

Inferential statistics

- Pre and post-test scores within group was analyzed by using paired "t" test.
- Post-test scores between the groups were analyzed using independent "t" test.
- Association between demographic variables and pre-test score was analyzed using chi-square test.

ETHICAL CONSIDERATION

The right to freedom from harm

- Though this study is an experimental design, the interventions used were not of harm to the patients.

The right to protection from exploitation

- Patient's information's were kept undercover.

The right to self-determination

- Research proposal was approved by specialty HOD and other senior professors.
- Prior permission was sought from higher authorities of institution before commencing the study.
- Before consent is sought the researcher has given details of the nature and purpose of the research and proposal outcome of the research.

CHAPTER IV

DATA ANALYSIS AND INTERPRETATION

This chapter deals with the data analysis collected among mechanically ventilated patients and interpretation of the present study involves compilation, editing, coding, classification and presentation of the data for statistical calculation in order to draw inferences and conclusions. Using descriptive and inferential statistics, the study objectives were computed.

Objectives

The data collected from the respondents were organized, tabulated, analyzed and includes applying descriptive and inferential statistics based on the objectives:

1. To assess the risk of ventilator associated pneumonia before and after implementation of comprehensive interventional package among patients in control and experimental group.
2. To determine the impact of comprehensive interventional package on ventilator associated pneumonia risk by comparing pre-test and post-test scores among control and experimental group.
3. To determine the impact of comprehensive interventional package on ventilator associated pneumonia risk by comparing post-test scores between the control and experimental group.
4. To find out the association between the risks of ventilator associated pneumonia among ventilated patients with their selected demographic and clinical variables in control and experimental group.

The findings were presented in the form of tables and diagrams under the following series:

Section- A. This section shows the description of the socio demographical and clinical variables

1. Frequency and percentage distribution of ventilated patients based on their socio-demographic variables.
2. Frequency and percentage distribution of ventilated patients based on their clinical variables.
3. Distribution of ventilated patients based on their pulmonary infection score in the experimental and control groups.

Section- B. Comparison of difference on risk of VAP among ventilated patients in the control and experimental groups

1. Mean score difference on risk of VAP among ventilated patients in control and experimental groups.
2. Paired' test on risk of VAP among ventilated patients within the control and experimental groups.
3. Independent't' test for comparison of difference on risk of VAP among ventilated patients between the control and experimental groups.

Section- C. Association of risk of VAP with selected socio demographic and clinical variables.

1. Association of risk of VAP among ventilated patients in experimental group with their selected demographic variables.

2. Association of risk of VAP among ventilated patients in control group with their selected demographic variables.
3. Association of risk of VAP among ventilated patients in experimental group with their selected clinical variables.
4. Association of risk of VAP among ventilated patients in control group with their selected clinical variables.

SECTION: A

Table: 4.A.1: Frequency and percentage distribution of ventilated patients based on their socio-demographic variables. (N=60)

S.No	Socio-demographic variables	Experimental group (n=30)		Control group (n=30)	
		f	%	f	%
1.	Age in years				
	a) ≤20 – 30	4	13.33	5	16.66
	b) 31 – 40	2	6.66	3	10
	c) 41 – 50	5	16.66	7	23.33
	d) 51 and above	19	63.33	15	50
2.	Gender				
	a) Male	23	76.66	23	76.66
	b) Female	7	23.33	7	23.33
3.	Educational status				
	a) Illiterate	9	30	10	33.33
	b) Literate	21	70	20	66.66
4.	Income (per month)				
	a) 1000 – 4000	3	10	0	0
	b) 4001 – 8000	9	30	8	26.66
	c) 8001 – 12000	10	33.33	11	36.66
	d) 12000 and above	8	26.66	11	36.66

5.	Marital status				
	a) Married	24	80	22	73.33
	b) Unmarried	6	20	8	26.66
6.	Occupation				
	a) Coolie	4	13.33	6	20
	b) Private employee	8	26.66	9	30
	c) Government employee	7	23.33	5	16.66
	d) House wife	3	10	5	16.66
	e) Retired	8	26.66	5	16.66

Table 4.A.1 divulges that among 60 ventilated patients, majority 19(63.33%) and 15(50%) of patients were between 51-60 and above years of age group in the experimental and control group respectively.

Regarding the gender, majority of patients, 23(76.66%) were male in both experimental and control groups.

In context of educational status, most of the patients were literate, 21(70%) and 20(66.66%) in experimental and control groups respectively.

While portraying the marital status, majority of the patients 24(80%) and 22(73.33%) were married in experimental and control groups respectively.

While seeing the type of occupation, majority of the patients were private employee 8(26.66%) in the experimental group and 9(30%) in the control group.

In context of income, most of the patients earn between Rs.8000 and Rs.12000 per month, 10(30%) in the experimental group and 11(36.66%) in the control group.

Table: 4.A.2: Frequency and percentage distribution of ventilated patients based on their clinical variables. (N=60)

S.No	Clinical variables	Experimental group (n=30)		Clinical group (n=30)	
		f	%	f	%
1.	Personal habit of				
	a) Smoking	4	18.33	5	16.66
	b) Alcoholism	5	16.66	4	13.33
	c) Both	13	43.33	12	40
	d) None	8	26.66	9	30
2.	Known history of				
	a) Pulmonary infection	5	16.66	3	10
	b) Neurological infection	8	26.66	8	26.66
	c) Systemic infection	5	16.66	5	16.66
	d) None	12	40	14	46.66
3.	Glasgow coma scale				
	a) 13 – 15	0	0	0	0
	b) 8 – 12	10	33.33	11	36.66
	c) Less than 8	20	46.66	19	63.33
4.	Use of anesthetic drugs				
	a) Relaxant drugs	6	20	5	16.66
	b) Sedative drugs	10	46.66	11	36.66
	c) Both	14	33.33	14	46.66

5.	Group of antibiotics received				
	a) Narrow spectrum	6	20	3	10
	b) Broad spectrum	14	46.66	15	50
	c) Both	10	33.33	12	40
6.	Administration of prophylactic drug				
	a) Sucralfate	0	0	0	0
	b) Pantoprazole	20	66.66	21	70
	c) Ranitidine	10	33.33	9	30
7.	Type of diagnosis				
	a) Neurologic disorder	11	36.66	10	33.33
	b) Respiratory disorder	3	10	3	10
	c) Trauma	13	43.33	10	33.33
	d) Cardiovascular disorder	3	10	6	20
	e) Poisoning	0	0	1	3.33
	f) Others	0	0	0	0
8.	Reason for intubation				
	a) Respiratory failure	8	26.66	7	23.33
	b) Airway protection	12	40	14	46.66
	c) Hemodynamic instability	10	33.33	9	30
9.	Type of intubation				
	a) Emergency	14	46.66	12	40
	b) Elective	16	53.33	18	60

Table 4.A.2 divulges that among 60 ventilated patients, majority 13(30%) and 12(33%) of patients were both alcoholic and smoker in the experimental and control group respectively.

Regarding the Known history of infection, highest 12(40%) and 14(46.66%) of patients had no previous history of infection in the experimental and control groups.

In context of Glasgow coma scale reading, most of the patients, 20(66.66%) and 19(63.33%) were having GCS of 8 and below in experimental and control groups respectively.

While portraying the use of anesthetic drugs, majority 14(46.66%) of patients were getting both sedatives and relaxant drugs both in experimental and control groups.

In context of the group of antibiotics given, 14(46.66%) and 15(50%) of patients were getting broad spectrums of antibiotics were given in experimental and control groups respectively.

Considering the administration of prophylactic drugs, majority of the patients were getting Pantoprazole 20(66.66%) and 21(70%) in the experimental and control groups respectively.

While seeing the type of diagnosis, majority of the patients were admitted with Trauma 13(43.33%) and 10(33.33%) in the experimental and control groups respectively.

Regarding the reason for intubation, most of the patients were intubated for airway protection 12(40%) and 14 (46.66%) in the experimental and control groups respectively.

While portraying the type of intubation, majority patients were electively intubated 16(53.33%) and 18(60%) in the experimental and control groups respectively.

Fig :4.1. Distribution of ventilated patients based on their risk of ventilator associated pneumonia in the experimental group. (n=30)

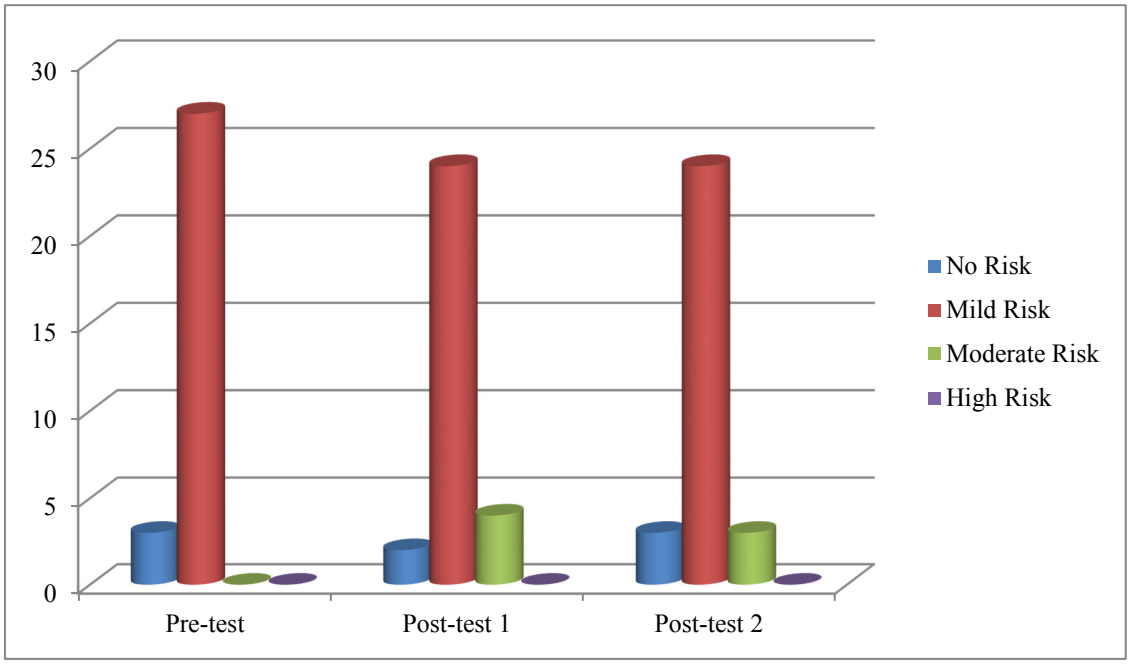


Figure 4.1 signifies the frequency and percentage of pre-test, post-test-1 and post-test-2risk of VAP among the ventilated patients. Out of the total 30 patients in the experimental group after the implementation of comprehensive interventional package, in the pre-test majority of the patient 27 (90%) had mild risk, 3 (10%) had no risk and none had moderate or high risk. Whereas in the post-test-1 most of the patients 24 (80%) had mild risk, 2 (6.66%) had no risk, 4 (13.33%) had moderate risk and none had high risk. Similarly in the post-test-2 majority of patients 24 (80%) had mild risk, 3 (10%) had moderate risk, 3 (10%) had no risk and none had high risk.

Fig :4.2. Distribution of ventilated patients based on their risk of ventilator associated pneumonia in the control group. (n=30)

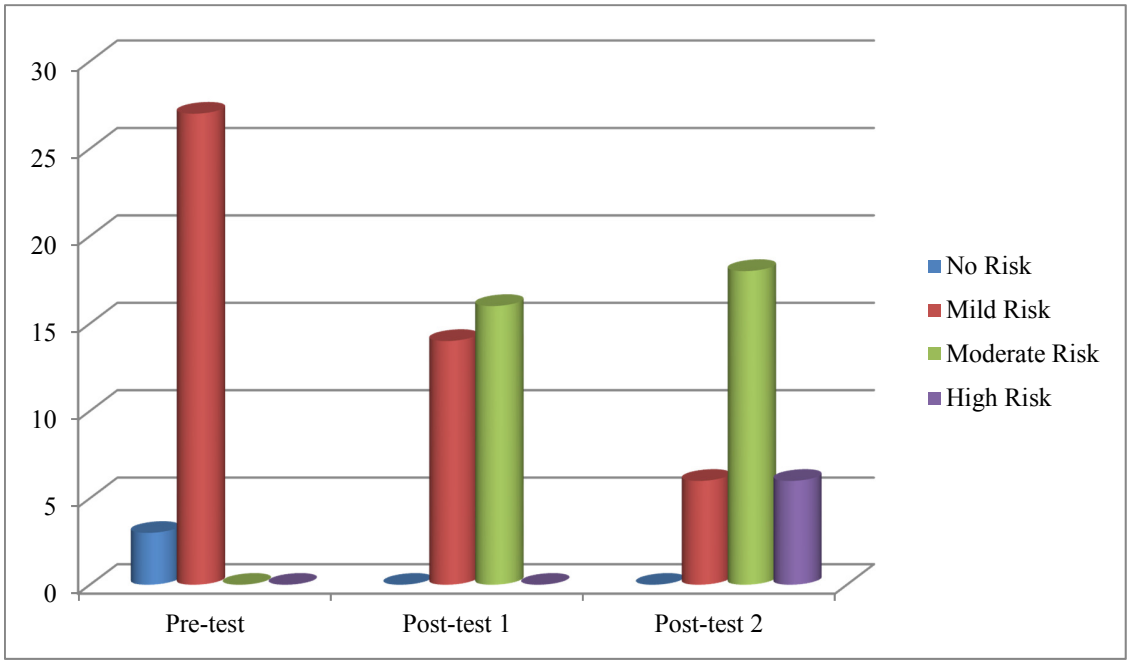


Figure 4.2 signifies the frequency and percentage of pre-test, post-test-1 and post-test-2risk of VAP among the ventilated patients. Out of the total 30 patients in the control group, in the pre-test relatively a high proportion of the patients 27 (90%) had mild risk, 3 (10%) had no risk and none of them had moderate or high risk. Whereas in the post-test-1 majority of the patient 16 (53.33%) had moderate risk, 14 (46.66%) had mild risk and none of them had no risk or high risk. Whereas in post-test-2 most of the patient 18 (60%) had moderate risk, 6 (20%) had high risk, 6 (20%) had mild risk and none of them had no risk.

SECTION: B

Table 4.B.1. Mean score difference of pre-test and post-test-1 on risk of VAP among ventilated patients in experimental group. **(n=30)**

Experimental group	Risk of VAP			
	Mean	S.D	Mean %	M.D
Pre-test	1.83	0.854	18.3	0.47
Post-test 1	2.3	1.069	23	

Table 4.B.1 displays the mean score difference of pre-test and post-test-1 on risk of VAP among ventilated patients in the experimental group. The results show that the post-test-1 mean score (2.3±1.069) was higher than the pre-test mean score (1.83±0.854) with the mean difference of 0.47.

The result inferred that the patients in experimental group have not developed risk of VAP after the implementation of comprehensive interventional package.

Table 4.B.2. Mean score difference of pre-test and post-test-1 on risk of VAP among ventilated patients in control group. (n=30)

Control group	Risk of VAP			
	Mean	S.D	Mean %	M.D
Pre-test	1.73	0.926	17.3	1.5
Post-test 1	3.23	1.228	32.3	

Table 4.B.2 elucidates the mean score difference between pre-test and post-test-1on risk of VAP in the control group. The findings show that the pre-test mean score (1.73±0.926) was much lower than the post-test-1 mean score (3.23±1.228) with the mean score difference of 1.5.

This result shows that the patients in control group have developed the risk of VAP without the implementation of comprehensive interventional package.

Table 4.B.3. Mean score difference in risk of VAP between pre-test and post-test-1 in the control and experimental groups. (n=30)

Group	Risk of VAP			
	Mean	S.D	Mean %	M.D
Experimental	2.3	1.069	23	0.93
Control	3.23	1.228	32.3	

Table 4.B.3 presents the comparison of the mean score difference between pre-test and post-test-1 in the control and experimental group. In the control group, post-test-1 mean score (3.23±1.228) has increased than the experimental group post-test-1 mean score (2.3±1.069) with the mean score difference of 0.93.

This result signifies that there is a difference between the post-test-1 mean score risk of VAP in the control group and the post-test-1 mean score of risk of VAP in experimental group, which implies that the comprehensive interventional package is effective.

Table 4.B.4. Mean score difference of pre-test and post-test-2 on risk of VAP among ventilated patients in experimental group. (n=30)

Experimental group	Risk of VAP			
	Mean	S.D	Mean %	M.D
Pre-test	1.83	0.854	18.3	0.3
Post-test 2	2.13	1.095	21.3	

Table 4.B.4 displays the mean score difference of pre-test and post-test-2 on risk of VAP among ventilated patients in the experimental group. The results show that the post-test-2 mean score (2.13±1.095) was higher than the pre-test mean score (1.83±0.854) with the mean difference of 0.3.

The result implies that the patients had not developed risk of VAP in the experimental group after the implementation of comprehensive interventional package.

Table 4.B.5. Mean score difference of pre-test and post-test-2 on risk of VAP among ventilated patients in control group. (n=30)

Control group	Risk of VAP			
	Mean	S.D	Mean %	M.D
Per-test	1.73	0.926	17.3	3.63
Post-test 2	5.36	2.448	53.6	

Table 4.B.5 elucidates the mean score difference between pre-test and post-test-2on risk of VAP in the control group. The findings show that the pre-test mean score (1.73±0.926) was much lower than the post-test-2 mean score (5.36±2.448) with the mean score difference of 3.63.

This shows that the patients in control group have developed risk of VAP without the implementation of comprehensive interventional package.

Table 4.B.6. Mean score difference in risk of VAP between pre-test and post-test-2 in the control and experimental groups. (n=30)

Group	Risk of VAP			
	Mean	S.D	Mean %	M.D
Experimental	2.13	1.095	21.3	3.23
Control	5.36	2.448	53.6	

Table 4.B.6 presents the comparison of the mean score difference between pre-test and post-test-2 in the control and experimental group. In the control group, post-test-2 mean score (5.36±2.448) has increased than the experimental group post-test-2 mean score (2.13±1.095) with the mean score difference of 3.23.

This result signifies that there is a difference between the post-test-2 mean score risk of VAP in the control group and the post-test-2 mean score of risk of VAP in experimental group, which implies that the comprehensive interventional package is effective in preventing the risk of VAP..

Table 4.B.7. Mean score difference of post-test-1 and post-test-2 on risk of VAP among ventilated patients in experimental group. (n=30)

Experimental group	Risk of VAP			
	Mean	S.D	Mean %	M.D
Post-test 1	2.3	1.069	23	0.17
Post-test 2	2.13	1.095	21.3	

Table 4.B.7 displays the mean score difference of post-test-1 and post-test-2 on risk of VAP among ventilated patients in the experimental group. The results show that the post-test-2 mean score (2.13±1.095) was higher than the post-test-1 mean score (2.3±1.069) with the mean difference of 0.17.

The result inferred that the patient in experimental group has not developed risk of VAP after the implementation of comprehensive interventional package.

Table 4.B.8. Mean score difference of post-test-1 and post-test-2 on risk of VAP among ventilated patients in control group. (n=30)

Control group	Risk of VAP			
	Mean	S.D	Mean %	M.D
Post-test 1	3.23	1.228	32.3	2.13
Post-test 2	5.36	2.448	53.6	

Table 4.B.8 elucidates the mean score difference between post-test-1 and post-test-2on risk of VAP in the control group. The findings show that the post-test-1 mean score (3.23±1.228) was lower than the post-test-2 mean score (5.36±2.448) with the mean score difference of 2.13.

This result implies that the patients in control group have developed the risk of VAP without the implantation of comprehensive interventional package.

Table 4.B.9. Mean score difference in risk of VAP between post-test-1 and post-test-2 in the control and experimental groups. (n=30)

Group	Risk of VAP			
	Mean	S.D	Mean %	M.D
Experimental	2.13	1.095	21.3	3.23
Control	5.36	2.448	53.6	

Table 4.B.9 presents the comparison of the mean score difference between post-test-1 and post-test-2 in the control and experimental group. In the control group, post-test-2 mean score (5.36±2.448) has increased than the experimental group post-test-2 mean score (2.13±1.095) with the mean score difference of 3.23.

This result signifies that there is a difference between the post-test-2 mean score risk of VAP in the control group and the post-test-2 mean score of risk of VAP in experimental group, which means that the comprehensive interventional package is effective.

Table 4.B.10. Paired‘t’ test on risk of VAP among ventilated patients in pre-test and post-test-1 within the experimental group. (n=30)

Experimental group	Mean	S.D	‘t’ value	‘p’ value
Pre-test	1.83	0.854	3.58	0.005
Post-test 1	2.3	1.069		

***(p<0.001)

Table 4.B.10 reveals that the paired‘t’ test score on risk of VAP within the experimental group is 3.58 and P=0.005 at p<0.001 level. This indicates that this difference is not significant within the pre-test and post-test-1 score.

The above finding clearly implies that comprehensive interventional package was effective in preventing the risk of ventilator associated pneumonia. Thus, the research hypothesis H_2 is accepted.

Table 4.B.11. Paired‘t’ test on risk of VAP among ventilated patients in pre-test and post-test-2 within the experimental group. (n=30)

Experimental group	Mean	S.D	‘t’ value	‘p’ value
Pre-test	1.83	0.854	1.8	0.41
Post-test 2	2.13	1.095		

***($p<0.001$)

Table 4.B.11 reveals that the paired‘t’ test score on risk of VAP within the experimental group is 1.8 and P=0.041 at $p<0.001$ level. This indicates that this difference is not significant within the pre-test and post-test-2 score.

The above finding clearly implies that comprehensive interventional package was effective in preventing the risk of ventilator associated pneumonia. Thus, the research hypothesis H_2 is accepted.

Table 4.B.12. Paired‘t’ test on risk of VAP among ventilated patients in post-test-1 and post-test-2 within the experimental group. (n=30)

Experimental group	Mean	S.D	‘t’ value	‘p’ value
Post-test 1	2.3	1.069	0.54	0.296
Post-test 2	2.13	1.095		

***($p<0.001$)

Table 4.B.12 reveals that the paired‘t’ test score on risk of VAP within the experimental group is 0.54 and P=0.296 at $p<0.001$ level. This indicates that this difference is not significant within the post-test-1 and post-test-2 score.

The above finding clearly implies that comprehensive interventional package was effective in preventing the risk of ventilator associated pneumonia. Thus, the research hypothesis H_2 is accepted.

Table 4.B.13. Paired‘t’ test on risk of VAP among ventilated patients in pre-test and post-test-1 within the control group. (n=30)

Control group	Mean	S.D	‘t’ value	‘p’ value
Pre-test	1.73	0.926	7.14	0.000***
Post-test 1	3.23	1.228		

***(p<0.001)

Table 4.B.13 depicts that the paired‘t’ test score on risk of VAP within the control group is 7.14 and P=0.000 at p<0.001 level, which indicates that this difference is considered to be highly significant within the pre-test and post-test-1 score.

The above finding implies that patients had developed the risk of ventilator associated pneumonia without the implementation of comprehensive interventional package. Thus the research hypothesis is H_2 is accepted.

Table 4.B.14. Paired‘t’ test on risk of VAP among ventilated patients in pre-test and post-test-2 within the control group (n=30)

Control group	Mean	S.D	‘t’ value	‘p’ value
Pre-test	1.73	0.926	7.56	0.000***
Post-test 2	5.36	2.448		

***(p<0.001)

Table 4.B.14 depicts that the paired‘t’ test score on risk of VAP within the control group is 7.56 and P=0.000 at p<0.001 level, which indicates that this difference is considered to be highly significant within the pre-test and post-test-2 score.

The above finding implies that patients had developed the risk of ventilator associated pneumonia without the implementation of comprehensive interventional package. Thus the research hypothesis is H_2 is accepted.

Table 4.B.15. Paired‘t’ test on risk of VAP among ventilated patients in post-test-1 and post-test-2 within the control group. (n=30)

Control group	Mean	S.D	‘t’ value	‘p’ value
Post-test 1	3.23	1.228	5.38	0.000***
Post-test 2	5.36	2.448		

***(p<0.001)

Table 4.B.15 depicts that the paired‘t’ test score on risk of VAP within the control group is 5.38 and P=0.000 at p<0.001 level, which indicates that this difference is considered to be highly significant within the post-test-1 and post-test-2 score.

The above finding implies that patients had developed the risk of ventilator associated pneumonia without the implementation of comprehensive interventional package. Thus the research hypothesis is H_2 is accepted.

Table 4.B.16. Independent‘t’ test for comparison of risk of VAP in pre-test and post-test-1 between experimental and control group. (n=30)

Group	Mean	S.D	‘t’ value	‘p’ value
Experimental	2.3	1.069	3.141	0.002
Control	3.23	1.228		

***(p<0.001)

Table 4.B.16 reveals the comparison of risk of VAP between control group and experimental group. The findings show overall independent‘t’ test score being 3.141 and P=0.002 at p<0.001 level. This indicates that this difference is not significant within the pre-test and post-test-1 score.

The finding implies that comprehensive interventional package was effective in preventing the risk of ventilator associated pneumonia in experimental group after the implementation of comprehensive interventional package. Thus the research hypothesis H_2 is accepted.

Table 4.B.17. Independent‘t’ test for comparison of risk of VAP in pre-test and post-test-2 between experimental and control group. (n=30)

Group	Mean	S.D	‘t’ value	‘p’ value
Experimental	2.13	1.095	8.136	0.000***
Control	5.36	2.448		

***(p<0.001)

Table 4.B.17 reveals the comparison of risk of VAP between control group and experimental group. The findings show overall independent‘t’ test score being 8.136 and P=0.000 at p<0.001 level. This indicates that this difference is not significant within the pre-test and post-test-2 score.

The finding implies that comprehensive interventional package was effective in preventing the risk of ventilator associated pneumonia in experimental group after the implementation of comprehensive interventional package. Thus the research hypothesis H_2 is accepted.

Table 4.B.18. Independent‘t’ test for comparison of risk of VAP in post-test-1 and post-test-2 between experimental and control group. (n=30)

Group	Mean	S.D	‘t’ value	‘p’ value
Experimental	2.13	1.095	8.136	0.000***
Control	5.36	2.448		

***(p<0.001)

Table 4.B.18 reveals the comparison of risk of VAP between control group and experimental group. The findings show overall independent‘t’ test score being 8.136 and P=0.000 at p<0.001 level. This indicates that this difference is not significant within the post-test-1 and post-test-2 score.

The finding implies that comprehensive interventional package was effective in preventing the risk of ventilator associated pneumonia in experimental group after the implementation of comprehensive interventional package. Thus the research hypothesis H_2 is accepted.

SECTION: C

Table 4.C.1. Association between risk of VAP and demographic variables of patients in experimental group. (n=30)

S.No	Socio-demographic variables	No risk		Mild risk		Moderate risk		High risk		χ^2	'p' value
		f	%	f	%	f	%	f	%		
1.	Age in years										
	a) ≤20 – 30	0	0	4	13.33	0	0	0	0		
	b) 31 – 40	0	0	2	6.66	0	0	0	0	0.827	0.999 NS
	c) 41 – 50	0	0	5	16.66	0	0	0	0		
	d) 51 – 60	3	10	16	53.33	0	0	0	0		
2.	Gender										
	a) Male	2	6.66	21	70	0	0	0	0	0.185	0.980 NS
	b) Female	1	3.33	6	20	0	0	0	0		
3.	Educational status										
	a) Illiterate	2	6.66	7	23.33	0	0	0	0	2.133	0.545 NS
	b) Literate	1	3.33	20	66.66	0	0	0	0		
4.	Income (per month)										
	a) 1000 – 4000	1	3.33	2	6.66	0	0	0	0		
	b) 4001 – 8000	1	3.33	8	26.66	0	0	0	0	1.914	0.992 NS
	c) 8001 – 12000	1	3.33	9	30	0	0	0	0		

	d) above 12000	0	0	8	26.66	0	0	0	0		
5.	Marital status										
	a) Married	3	10	21	70	0	0	0	0	0.232	0.972 NS
	b) Unmarried	0	0	6	20	0	0	0	0		
6.	Occupation										
	a) Coolie	0	0	4	13.33	0	0	0	0	2.209	0.999 NS
	b) Private employee	1	3.33	7	23.33	0	0	0	0		
	c) Govt. employee	0	0	7	23.33	0	0	0	0		
	d) House wife	0	0	3	10	0	0	0	0		
	e) Retired	2	6.66	6	20	0	0	0	0		

Note: significant at * $p<0.05$ level

Table 4.C.1.presents the association between the selected demographic variables with pre-test risk of VAP among ventilated patients in experimental group, which infers that there is no association at 0.05 level. Hence the Research Hypothesis (H_3) is rejected.

Table 4.C.2. Association between risk of VAP and demographic variables of patients in control group. (n=30)

S.No	Socio-demographic variables	No risk		Mild risk		Moderate risk		High risk		χ^2	'p' value
		f	%	f	%	f	%	f	%		
1.	Age in years										
	a) ≤20 – 30	1	3.33	4	13.33	0	0	0	0		
	b) 31 – 40	0	0	3	10	0	0	0	0	0.864	0.999 NS
	c) 41 – 50	1	3.33	6	20	0	0	0	0		
	d) 51 – 60	1	3.33	14	46.66	0	0	0	0		
2.	Gender										
	a) Male	2	6.66	21	70	0	0	0	0	0.185	0.980 NS
	b) Female	1	3.33	6	20	0	0	0	0		
3.	Educational status										
	a) Illiterate	1	3.33	9	30	0	0	0	0	0	1.000 NS
	b) Literate	2	6.66	18	60	0	0	0	0		
4.	Income (per month)										
	a) 1000 – 4000	0	0	0	0	0	0	0	0		
	b) 4001 – 8000	1	3.33	7	23.33	0	0	0	0	0.075	1.000 NS
	c) 8001 – 12000	1	3.33	10	33.33	0	0	0	0		
	d) above 12000	1	3.33	10	33.33	0	0	0	0		

5.	Marital status										
	a) Married	2	6.66	20	66.66	0	0	0	0	0.075	0.994 NS
	b) Unmarried	1	3.33	7	23.33	0	0	0	0		
6.	Occupation										
	a) Coolie	1	3.33	5	16.66	0	0	0	0	1.56	0.999 NS
	b) Private employee	0	0	9	30	0	0	0	0		
	c) Govt. employee	1	3.33	4	13.33	0	0	0	0		
	d) House wife	1	3.33	4	13.33	0	0	0	0		
	e) Retired	0	0	5	16.66	0	0	0	0		

Note: significant at * $p<0.05$ level

Table 4.C.2.presents that there was no significant association between risk of VAP and the selected demographic variables in the control group at 0.05 level stating that the research Hypothesis (H_3) is rejected.

Table 4.C.3. Association between risk of VAP and clinical variables in experimental group.

(n=30)

S.No	Clinical variables	No risk		Mild risk		Moderate risk		High risk		χ^2	'p' value
		F	%	f	%	F	%	F	%		
1.	Personal habit of										
	a) Smoking	0	0	4	13.33	0	0	0	0		
	b) Alcoholism	0	0	5	16.66	0	0	0	0	0.818	0.999
	c) Both	2	6.66	11	36.66	0	0	0	0		NS
	d) None	1	3.33	7	23.33	0	0	0	0		
2.	Known history of										
	a) Pulmonary infection	0	0	5	16.66	0	0	0	0		
	b) Neurological disorder	1	3.33	7	23.33	0	0	0	0	0.701	0.999
	c) Systemic infection	1	3.33	4	13.33	0	0	0	0		NS
	d) None	1	3.33	11	36.66	0	0	0	0		
3.	Glasgow comma scale										
	a) 13-15	0	0	0	0	0	0	0	0		
	b) 8-12	0	0	10	33.33	0	0	0	0	0.666	0.995
	c) less than 12	3	10	17	56.66	0	0	0	0		NS

4.	Use of anesthetic drugs										
	a) Relaxant drug	0	0	6	20	0	0	0	0		
	b) Sedation	1	3.33	9	30	0	0	0	0	0.351	0.999 NS
	c) Both	2	6.66	12	40	0	0	0	0		
5.	Group of antibiotics receiving										
	a) Narrow spectrum	0	0	6	20	0	0	0	0		
	b) Broad spectrum	1	3.33	13	43.33	0	0	0	0	0.403	0.998 NS
	c) Both	2	6.66	8	26.66	0	0	0	0		
6.	Administration of prophylactic drugs										
	a) Sucralfate	0	0	0	0	0	0	0	0		
	b) Pantoprazole	2	6.66	18	60	0	0	0	0	0	1.000 NS
	c) Ranitidine	1	3.33	9	30	0	0	0	0		
7.	Type of diagnosis										
	a) Neurological disorder	1	3.33	10	33.33	0	0	0	0		
	b) Respiratory disorder	0	0	3	10	0	0	0	0		
	c) Trauma	0	0	13	43.33	0	0	0	0	10.887	0.760 NS
	d) Cardiovascular disorder	2	6.66	1	3.33	0	0	0	0		
	e) Poisoning	0	0	0	0	0	0	0	0		
	f) Others	0	0	0	0	0	0	0	0		

8.	Reason for intubation										
	a) Respiratory failure	1	3.33	7	23.33	0	0	0	0		
	b) Airway protection	2	6.66	10	33.33	0	0	0	0	0.758	0.993 NS
	c) Hemodynamic instability	0	0	10	33.33	0	0	0	0		
9.	Type of intubation										
	a) Emergency	2	6.66	12	40	0	0	0	0	0.565	0.904
	b) Elective	1	3.33	15	50	0	0	0	0		NS

Note: significant at * $p<0.05$ level

Table 4.C.3. presents that there is no significant association between the pre-test risk of VAP in experimental group and selected clinical demographic variables at $p<0.05$level. Hence the Research Hypothesis (H_3) is rejected.

Table 4.C.4. Association between risk of VAP and clinical variables in control group.

(n=30)

S.No	Clinical variables	No risk		Mild risk		Moderate risk		High risk		χ^2	'p' value
		f	%	f	%	F	%	F	%		
1.	Personal habit of										
	a) Smoking	1	3.33	4	13.33	0	0	0	0		
	b) Alcoholism	0	0	4	13.33	0	0	0	0	0647	0.999
	c) Both	1	3.33	11	36.66	0	0	0	0		NS
	d) None	1	3.33	8	26.66	0	0	0	0		
2.	Known history of										
	a) Pulmonary infection	0	0	3	10	0	0	0	0		
	b) Neurological disorder	0	0	8	26.66	0	0	0	0	2.207	0.987
	c) Systemic infection	0	0	5	16.66	0	0	0	0		NS
	d) None	3	10	11	36.66	0	0	0	0		
3.	Glasgow comma scale										
	a) 13-15	0	0	0	0	0	0	0	0		
	b) 8-12	1	3.33	10	33.33	0	0	0	0	0.015	1.000
	c) less than 12	2	6.66	17	56.66	0	0	0	0		NS

4.	Use of anesthetic drugs										
	a) Relaxant drug	1	3.33	4	13.33	0	0	0	0		
	b) Sedation	1	3.33	10	33.33	0	0	0	0	0.691	0.994 NS
	c) Both	1	3.33	13	43.33	0	0	0	0		
5.	Group of antibiotics receiving										
	a) Narrow spectrum	1	3.33	2	6.66	0	0	0	0		
	b) Broad spectrum	1	3.33	14	46.66	0	0	0	0	2.034	0.916 NS
	c) Both	1	3.33	11	36.66	0	0	0	0		
6.	Administration of prophylactic drugs										
	a) Sucralfate	0	0	0	0	0	0	0	0		
	b) Pantoprazole	0	0	21	70	0	0	0	0	5.677	0.460 NS
	c) Ranitidine	3	10	6	20	0	0	0	0		
7.	Type of diagnosis										
	a) Neurological disorder	2	6.66	8	26.66	0	0	0	0		
	b) Respiratory disorder	0	0	3	10	0	0	0	0		
	c) Trauma	1	3.33	9	30	0	0	0	0	1.221	1.000 NS
	d) Cardiovascular disorder	0	0	6	20	0	0	0	0		
	e) Poisoning	0	0	1	3.33	0	0	0	0		
	f) Others	0	0	0	0	0	0	0	0		

8.	Reason for intubation										
	a) Respiratory failure	1	3.33	6	20	0	0	0	0		
	b) Airway protection	2	6.66	12	40	0	0	0	0	0.527	0.997 NS
	c) Hemodynamic instability	0	0	9	30	0	0	0	0		
9.	Type of intubation										
	a) Emergency	1	3.33	11	36.66	0	0	0	0	0.06	0.996 NS
	b) Elective	2	6.66	16	53.33	0	0	0	0		

Note: significant at * $p<0.05$ level

Table 4.C.4.shows no significant association between selected clinical variables with pre-test risk of VAP among ventilated patients in the control group at 0.05 level, stating that the Research Hypothesis (H_3) is rejected with regards to all variables.

CHAPTER V

DISCUSSION

This chapter presents the discussion part in relation to the similar studies conducted by other researcher. The main aim of the study was to evaluate the impact of comprehensive interventional package to identify the risk of ventilator associated pneumonia among ventilated patients. This study was conducted using quasi experimental design. Subjects were selected by convenience sampling method. The sample size was 60. Risk assessment tool for VAP tool was used to identify the risk of ventilator associated pneumonia among ventilated patients. The results were analyzed through descriptive measures (mean, frequency, percentage, standard deviation) and inferential statistics (chi-square, 't' test).

As nurses roles change in response to the dynamics of managed care and an increase in use of advanced technology and nursing care, more is expected of them both in terms of psychomotor and cognitive skills. Critically thinking is currently a highly valued educational outcome throughout the educational and clinical settings, especially in relation to higher and professional standards.

The discussion is based on the objectives and Hypothesis specified in this study.

Objectives of the study were to

1. To assess the risk of ventilator associated pneumonia before and after implementation of comprehensive interventional package among patients in control and experimental group.

2. To determine the impact of comprehensive interventional package on ventilator associated pneumonia risk by comparing pre-test and post-test scores among control and experimental group.
3. To determine the impact of comprehensive interventional package on ventilator associated pneumonia risk by comparing post-test scores between the control and experimental group.
4. To find out the association between the risks of ventilator associated pneumonia among ventilated patients with their selected demographic and clinical variables in control and experimental group.

Hypothesis of the study were to

1. There is a significant difference in the pre-test and post-test score among control and experimental group before and after implementation of comprehensive interventional package.
2. The mean post-test score of risk of ventilator associated pneumonia is significantly higher among the ventilated patients in experimental group than the ventilated patients in the control group.
3. There is a statistically significant association between risk of ventilator associated pneumonia with selected demographic and clinical variables in both control and experimental group.

The first objective of this study was to assess the risk of ventilator associated pneumonia before and after implementation of comprehensive interventional package among patients in control and experimental group.

The above objective of the study was to identify the risk of Ventilator Associated Pneumonia among the mechanically ventilated patients before and after implementation of comprehensive interventional package.

In the experimental group, Out of the total 30 patients after the implementation of comprehensive interventional package, in the pre-test majority of the patient 27 (90%) had mild risk, 3 (10%) had no risk and none had moderate or high risk. Whereas in the post-test-1 most of the patients 24 (80%) had mild risk, 2 (6.66%) had no risk, 4 (13.33%) had moderate risk and none had high risk. Similarly in the post-test-2 majority of patients 24 (80%) had mild risk, 3 (10%) had moderate risk, 3 (10%) had no risk and none had high risk.

Whereas in the control group, Out of the total 30 patients, in the pre-test relatively a high proportion of the patients 27 (90%) had mild risk, 3 (10%) had no risk and none of them had moderate or high risk. Whereas in the post-test-1 majority of the patient 16 (53.33%) had moderate risk, 14 (46.66%) had mild risk and none of them had no risk or high risk. Whereas in post-test-2 most of the patient 18 (60%) had moderate risk, 6 (20%) had high risk, 6 (20%) had mild risk and none of them had no risk.

This study was supported with a study done by Virginia Bonsal Cooper et.al. (2013), she conducted a prospective study on incidence and risk factor for ventilator associated pneumonia in critically ill patients in Canada. Data was collected from 16 ICUs to determine the conditional probability and cumulative risk over the duration of stay in the ICUs. The sample was 1014

mechanically ventilated patients. The results showed that 177 (17.5%) patients developed higher risk for ventilator associated pneumonia, whereas 526 (51.87%) patients developed moderate risk for ventilator associated pneumonia and 311 (30.67%) developed mild risk after the ICU admission.

This was also supported by the study done by Tsai.el.al. (2008), who conducted a prospective evaluation of usefulness of intermittent suctioning of oral secretions before each position change in reducing VAP. A time sequence non randomized intervention design was used. After a duration of 9 month observation phase and 6 month education phase, followed by a 7 month intervention phase the occurrence of VAP rate was reduced in studied group (6 of 227 patients, 2.6%) than control group (26 of 237 patients, 11%) ($p<0.001$). The incidence of VAP in control and study group was 6.51 and 2.04 per 1000 ventilated days respectively ($p=0.002$). The results revealed that intermittent suction of oral secretion before each position change proved to be effective in reducing VAP.

The second objectives of the study was to determine the impact of comprehensive interventional package on ventilator associated pneumonia risk by comparing pre-test and post-test scores among control and experimental group.

The above objective of the study was to determine the impact of comprehensive interventional package on risk of ventilator associated pneumonia.

In the experimental group, out of 30 patients after the implementation of comprehensive interventional package, the mean score for risk of Ventilator Associated Pneumonia in pre-test was (1.83±0.854), mean post-test-1 score was (2.3±1.069) and mean post-test-2 score was

(2.13±1.095), with a mean difference of 0.47 (pre-test and post-test-1), 0.3 (pre-test and post-test-2) and 0.17 (post-test-1 and post-test-2).

In the control group, out of 30 patients the mean pre-test score for risk of Ventilator Associated Pneumonia was (1.73±0.926), mean post-test-1 score was (3.23±1.228) and mean post-test-2 score was (5.36±2.448), with a mean difference of 1.5 (pre-test and post-test-1), 3.63 (pre-test and post-test-2) and 2.13 (post-test-1 and post-test-2).

This above findings implies that comprehensive interventional package is effective in reducing the risk of ventilator associated pneumonia among mechanically ventilated patients.

The finding of the present study was supported with a study done by Christine Ilson et.al. (20010), who conducted a study to assess the effectiveness of selective oropharyngeal decontamination on the risk of ventilator associated pneumonia. It suggested that chlorhexidine gluconate rinses for patients in experimental group might be beneficial in reducing bacteria in dental plaque, which may be a source of pathogens for development of ventilator associated pneumonia. The study reveals that out of 50 patients 29 (58%) had no risk, whereas 15 (30%) patients developed some risks and 6 (12%) developed high risk for ventilator associated pneumonia. Topically applied antibiotics, or chlorhexidine gluconate rinses may aid in reducing bacteria in mouth, potentially decreasing the risk for ventilator associated pneumonia.

The third objective of the study was to determine the impact of comprehensive interventional package on ventilator associated pneumonia risk by comparing post-test score between the control and experimental group.

Out of 60 patients in experimental and control group, the mean post-test-1 score (2.3±1.069) of the experimental group was found to be lower than the post-test-1 score

(3.23±1.228) of the control group, with the mean difference of 0.93, and the mean post-test-2 score (2.13±1.095) of the experimental group was found to be lower than the post-test-2 score (5.36±2.448) of the control group, with the mean difference of 3.23

Regarding the risk of Ventilator Associated Pneumonia, obtained from independent 't' test value in the control and experimental group after the implementation of comprehensive interventional package on risk of Ventilator Associated Pneumonia was 3.141 (post-test-1) and 8.136 (post-test-2) ($p<0.001$).

Regarding risk of Ventilator Associated Pneumonia, obtained paired 't' value of experimental group was 3.58, 1.8 and 0.54 at $p<0.001$ level, which indicates that this difference shows no significance and paired 't' value of the control group was 7.14, 7.56 and 5.38, which is considered to be highly significant. It indicates that the risk of Ventilator Associated Pneumonia was prevented after the implementation of comprehensive interventional package in the experimental group.

This was supported with a study conducted by Garcia et.al. (2009), she conducted a quasi experimental study to determine the effect of a comprehensive oral and dental care protocol on the rate of VAP by pre-post interventional study. Adults receiving mechanical ventilation more than 48 hours in Brookdale University Hospital were studied in a two consecutive 24 month periods. Pre-interventional group (n=779) had no oral assessments, no subglottic suctioning, no tooth brushing, and suctioning of secretions in oral cavity as needed. The interventional group (n=759) was treated with a protocol which included oral assessment, deep suctioning every 6 hours, oral tissue cleaning every 4 hours or as needed and tooth brushing twice daily. VAP rate was determined using clinical pulmonary infection score (CPIS) (CPIS>6). The rate of VAP was

found to be 12% per 1000 ventilator days before the intervention and decreased to 8.0% per 1000 ventilator days during the intervention (p=0.006). Research study results concluded that the implementation of comprehensive oral care protocol and staff compliance significantly reduced the VAP rate and its associated costs.

The fourth objective of the study was to find out the association between the risks of ventilator associated pneumonia among ventilated patients with their selected demographic and clinical variables in control and experimental group.

The findings of the study reveals the association between pre-test, post-test-1 and post-test-2 risk of Ventilator Associated Pneumonia among mechanically ventilated patients with selected socio-demographic and clinical variables in both experimental and control group.

There was no association between pre-test risk of Ventilator Associated Pneumonia with selected socio-demographic and clinical variables in both experimental and control group. Hence the Research Hypothesis H_3 is rejected.

Regarding post-test-1, there was no association between post-test-1 risk of Ventilator Associated Pneumonia with selected socio-demographic and clinical variables in both experimental and control group. Hence the Research Hypothesis H_3 is rejected.

Regarding post-test-2, there was no association between post-test-1 risk of Ventilator Associated Pneumonia with selected socio-demographic and clinical variables in both experimental and control group, except Gender and Occupation which shows significant association in experimental group. Hence the Research Hypothesis H_3 is accepted.

This was supported by the study conducted by Shobha Gaikward et.al. (2000), she conducted a prospective observational study in NICU of CSM Medical University, Lucknow (UP) to assess aetilology and risk factors of VAP in neonates over a period of one year. Neonates admitted in NICU who required mechanical ventilation for more than 48 hours were enrolled in to the study the study group comprised of 98 neonates out of which, 30 neonates developed VAP (30.6%). VAP rates were 37.2 per 1000 days of mechanical ventilation. Most common bacterial organisms isolated from endotracheal aspirate of VAP patients were Klebsiella spp (32.8%), E coli (23.2%), and Acinobacter (17.8%). Multiple regression analysis revealed that duration of mechanical ventilation (OR 1.10, 95% CI 1.02, 1:21; P=0.021) and very low birth weight (OR 3.88, 95% CI 1.05, 14.34; P=0.042) were two statistically significant risk factors in predicting VAP. Results revealed that very low birth, prematurity, duration of mechanical ventilation, number of reintubations, and length of ICU stay were significantly associated with VAP in bivariate analysis. Showed the occurrence of VAP was less in experimental group as compared to control group.

CHAPTER VI

SUMMARY AND RECOMMENDATIONS

The essence of any research study is based on the study findings. A study is said to be incomplete, if its results are not communicated effectively to its users and consumers. This chapter deals with the summary and conclusion drawn. It focuses on the implications and gives recommendation for Nursing education, Nursing practice, Nursing administration and Nursing research.

SUMMARY OF THE STUDY

The main focus of the present study was to evaluate the impact of comprehensive interventional package to identify the risk of ventilator associated pneumonia among ventilated patients in selected hospital, Madurai. A quantitative approach was selected for this study.

This was a quasi-experimental study in which pre-test and post-test control group design was adopted. Tool was developed and used for collecting data to assess the risk of ventilator associated pneumonia on ventilated patients. The reliability of the tool was established by test re-test method. The tool was administered among mechanically ventilated patients in Vadamalayan Hospital and Velammal Medical College Hospital, Madurai. The tool was found to be reliable. The data gathered was analyzed and interpreted in terms of the study objectives.

The main study was conducted in Vadamalayan Hospital and Velammal Medical College Hospital, Madurai for a period of ten weeks. The non-probability convenience sampling method was used for sampling technique procedure. Data was collected from the respondent, reorganized and interpreted using both descriptive and inferential statistics.

The objectives of the study were following

1. To assess the risk of ventilator associated pneumonia before and after implementation of comprehensive interventional package among patients in control and experimental group.
2. To determine the impact of comprehensive interventional package on ventilator associated pneumonia risk by comparing pre-test and post-test scores among control and experimental group.
3. To determine the impact of comprehensive interventional package on ventilator associated pneumonia risk by comparing post-test scores between the control and experimental group.
4. To find out the association between the risks of ventilator associated pneumonia among ventilated patients with their selected demographic and clinical variables in control and experimental group.

The research hypothesis stated were,

H_1- There is a significant difference in the pre-test and post-test score among control and experimental group before and after implementation of comprehensive interventional package.

H_2- The mean post-test score of risk of ventilator associated pneumonia is significantly higher among the ventilated patients in experimental group than the ventilated patients in the control group.

H_3- There is a statistically significant association between risk of ventilator associated pneumonia with selected demographic and clinical variables in both control and experimental group.

Major findings of the study

In the experimental group, Out of the total 30 patients after the implementation of comprehensive interventional package, in the pre-test majority of the patient 27 (90%) had mild risk, 3 (10%) had no risk and none had moderate or high risk. Whereas in the post-test-1 most of the patients 24 (80%) had mild risk, 2 (6.66%) had no risk, 4 (13.33%) had moderate risk and none had high risk. Similarly in the post-test-2 majority of patients 24 (80%) had mild risk, 3 (10%) had moderate risk, 3 (10%) had no risk and none had high risk. The risk of Ventilated Associated Pneumonia risk score in pre-test was 1.83, post-test-1 was 2.3 and the post-test-2 was 2.13. The paired 't' test for the risk of ventilated associated pneumonia was 3.58, 1.8 and 8.136, which shows there is no raise in the risk of Ventilated Associated Pneumonia in the pre-test, post-test-1 and post-test-2 among experimental group after the implementation of comprehensive interventional package.

Whereas in the control group, Out of the total 30 patients, in the pre-test relatively a high proportion of the patients 27 (90%) had mild risk, 3 (10%) had no risk and none of them had moderate or high risk. Whereas in the post-test-1 majority of the patient 16 (53.33%) had moderate risk, 14 (46.66%) had mild risk and none of them had no risk or high risk. Whereas in post-test-2 most of the patient 18 (60%) had moderate risk, 6 (20%) had high risk, 6 (20%) had mild risk and none of them had no risk. The risk of Ventilated Associated Pneumonia risk score in pre-test was 1.73, post-test-1 was 3.23 and the post-test-2 was 25.36. The paired 't' test for the risk of ventilated associated pneumonia was 7.14, 7.56 and 5.38, which shows there is raise in the risk of Ventilated Associated Pneumonia in the pre-test, post-test-1 and post-test-2 among control group without the implementation of comprehensive interventional package.

It can be interpreted that the risk of ventilator Associated Pneumonia has not increased in the experimental after the implementation of comprehensive interventional package.

Regarding the impact of comprehensive interventional package, the mean score for post-test-2 was lower than the mean score for post-test-1. It was 2.3 in the post-test-1 and 2.13 in the post-test-2. The paired‘t’ test for the risk of Ventilator Associated Pneumonia was 5.38 ($p<0.001$), which was highly significant. The independent ‘t’ test was 8.136 ($p<0.001$), which was highly significant. This was statistically proven that the impact of comprehensive interventional package on risk of Ventilator Associated Pneumonia was effective among mechanically ventilated patients.

Regarding association between the pre-test risk of Ventilated Associated Pneumonia with the selected socio-demographic and clinical variables, there is no significant association between the risk of Ventilator Associated Pneumonia with the selected socio-demographic and clinical variables.

Thus, the finding of this study provides an empirical evidence to prove that the implementation of comprehensive interventional package is a good method to prevent the risk of Ventilator Associated Pneumonia among the mechanically ventilated patients.

LIMITATIONS

1. The study is limited to identifying the risk of ventilator associated pneumonia among ventilated patients by modified clinical pulmonary infection score
2. Patients who were mechanically intubated (more more than 12 hours at pre-test).
3. Patients intubated in the same hospital and not the patients being intubated in other hospitals and brought for further management.

4. In this study, the data was collected from a small number of samples (60).

IMPLICATIONS

The findings of the study have several implications in the following field, it can be discussed on four areas namely. Nursing education, Nursing practice, Nursing administration and Nursing research.

Implications in Nursing educations

- This study has provided the important tool for preventing the risk of Ventilator Associated Pneumonia among mechanically ventilated patients through implementation of comprehensive interventional package.
- The findings will help the nursing students to understand the need to be educated and create awareness regarding risk of Ventilator Associated Pneumonia.
- It helps the nursing facilities to give more importance for planning and implementing comprehensive interventional package to prevent risk of Ventilator Associated Pneumonia.
- Current research regarding risk of Ventilator Associated Pneumonia bestows an opportunity for nursing students about the need for awareness and knowledge regarding comprehensive interventional package.

Implications in Nursing practice

- The findings of the study will help the nurses to prevent risk of Ventilator Associated Pneumonia with the help of implementing comprehensive interventional package.

- The findings will help the nursing personnel to estimate the impact of comprehensive interventional package on risk of Ventilator Associated Pneumonia.
- The nursing personnel will understand the necessity of gaining knowledge about comprehensive interventional package.
- Nurses can utilize the knowledge regarding comprehensive interventional package in clinical practice.

Implications in Nursing administration

- The present study will help the nursing administrative authority to recognize the need for developing an appropriate educational program for college students.
- Nurse as an administrator has a crucial role in planning the awareness program imparting information to nursing staffs and students.
- Nursing administration must see that a separate budget should be allocated for in-service education in the nursing department.
- Optimizing the knowledge on risk of Ventilator Associated Pneumonia among nurses will improve their professional knowledge as nursing world is always changing and challenging.

Implications in Nursing research

- The findings of the study will help to expand the scientific body of professional knowledge for further research.
- Based on this study, in-depth research studies of various factors contribute for risk of Ventilator Associated Pneumonia prevention among diploma nurses and basis nursing degree holders.

- Large scale studies can be conducted in consideration of other contributing variables.

CONCLUSION

The main conclusion of this study shows that implementation of preventive care plays an important role in bringing changes in health conditions and reducing complications among mechanically ventilated patients. The investigator assures that every patient who had taken part in this study will be prevented from the risk of Ventilator Associated Pneumonia.

RECOMMENDATIONS

On the basis of the findings of this study, the following recommendation has been made for further studies.

1. A similar study can be undertaken by utilizing other domain of advance nursing practices.
2. A similar study can be undertaken with large number of samples which might lead to generalization.
3. A similar study can be conducted in other settings.
4. As per the results of the study, it is recommended that comprehensive interventional package can be encouraged to be carried out in clinical setting as a preventive approach for VAP in mechanically ventilated patients.
5. It is also recommended to conduct further research studies to discover more effective strategies to prevent VAP among mechanically ventilated patients.

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APPENDIX-A

LETTER SEEKING EXPERTS OPINION FOR CONTENT VALIDITY

From

Mr. D. Deepak Stephen,
II year M.sc (N),
C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Health sciences,
Pasumalai, Madurai-4.

To

Respected sir/Madam,

Sub: Requisition for opinions and suggestions of experts for content validity of the research tool.

With due regards, I kindly bring to your valuable notice that , I am doing my post-graduation in nursing at C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Health sciences, Madurai. As a part of my university requirement, I am supposed to complete a research study, for which I have selected the following topic,

"**Study to evaluate the impact of comprehensive interventional package to identify the risk of ventilator associated pneumonia among ventilated patients in selected hospital, Madurai"**

I am in need of your valuable opinions and suggestions regarding the tool which I have prepared. So I humbly request you to spare a little of your precious time to validate the tool, for which I remain ever grateful to you.

Thanking you,

Place: Pasumalai Yours sincerely,

Date: (D. Deepak Stephen)

APPENDIX-B

LETTER SEEKING PERMISSION TO CONDUCT THE PILOT STUDY

From
Mr. D. Deepak Stephen,
II year M.sc (N),
C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Health sciences,
Pasumalai, Madurai-4.

To

Forwarded through
The principal,
C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Health sciences,
Pasumalai, Madurai-4.

Respected sir/Madam,

Sub: Seeking permission to conduct the pilot study.

With due regards, I kindly bring to your valuable notice that, I am a post graduate student of C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Sciences, Madurai. As a part of my requirement I am supposed to complete a research study for which I have selected the following topic:

"**Study to evaluate the impact of comprehensive interventional package to identify the risk of ventilator associated pneumonia among ventilated patients in selected hospital, Madurai"**

I would like to do my study in your esteemed institution. So I humbly request you to give me permission to conduct the study for which I remain grateful.

Thanking you in anticipation

Place: Pasumalai, Yours sincerely,

Date: (D. Deepak Stephen)

APPENDIX-C

LETTER SEEKING PERMISSION TO CONDUCT THE RESEARCH STUDY

From
Mr. D. Deepak Stephen,
II year M.sc (N),
C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Health sciences,
Pasumalai, Madurai-4.

To

Forwarded through
The principal,
C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Health sciences,
Pasumalai, Madurai-4.

Respected sir/Madam,

Sub: Seeking permission to conduct the research study.

With due regards, I kindly bring to your valuable notice that, I am a post graduate student of C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Sciences, Madurai. As a part of my requirement I am supposed to complete a research study for which I have selected the following topic:

"**Study to evaluate the impact of comprehensive interventional package to identify the risk of ventilator associated pneumonia among ventilated patients in selected hospital, Madurai"**

I would like to do my study in your esteemed institution. So I humbly request you to give me permission to conduct the study for which I remain grateful.

Thanking you in anticipation

Place: Pasumalai, Yours sincerely,

Date: (D. Deepak Stephen)

APPENDIX-D

CERTIFICATE OF VALIDATION

This is to certify that the tool developed by **Mr. D. Deepak Stephen** M.Sc (N) II year student of C.S.I. Jeyaraj Annapackiam College of Nursing, Pasumalai, Madurai.(Affiliated to the Tamil Nadu Dr.M.G.R. Medical University, Chennai) is validated by the undersigned, can proceed with this tool and conduct the main study for dissertation entitled,

"**Study to evaluate the impact of comprehensive interventional package to identify the risk of ventilator associated pneumonia among ventilated patients in selected hospital, Madurai**"

Place: **Signature:**

Date: **Name:**

Designation:

Address:

APPENDIX – E

LIST OF EXPERTS FOR CONTENT VALIDITY OF THE TOOL

1. Dr. Mr. Jayanthnath. R., M.B.B.S., M.D.,

   Neuro Physician

   Hannah Joseph Hospital

   K.K.Nagar, Madurai-20

2. Prof. Dr. Mrs. Jasmine Parimala. P., M.Sc(N).,Ph.D.,

   H.O.D of Medical Surgical Nursing Department

   Caldwell College of nursing,

   Idaiyangudi, Tirunelveli-51

3. Mrs. Suguna Doraisamy., R.N.R.M.,

   Assistant Matron

   C.R.P.F Composite Hospital

   Pallipuram, Trivandrum-16.

4. Prof. Dr. Mrs. Jaya Thanga Selvi., M.Sc(N).,Ph.D.,

   H.O.D of Medical Surgical Nursing Department

   C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Sciences,

   Pasumalai, Madurai – 04

5. Prof. Dr. Mr. John Sam Arun Prabu.Y., M.Sc(N).,Ph.D.,

   H.O.D of Community Health Nursing Department

   C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Sciences,

Pasumalai, Madurai – 04

6. Prof. Mrs. Shanthi. P., M.Sc(N).,(Ph.D).,

   H.O.D of Maternal Health Nursing Department

   C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Sciences,

   Pasumalai, Madurai – 04

7. Prof. Dr. Mrs. Jessie Metilda. N., M.Sc(N).,Ph.D.,

   H.O.D of Child Health Nursing Department

   C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Sciences,

   Pasumalai, Madurai – 04

8. Prof. Dr. Mrs. Jancy Rachel Daisy. R., M.Sc(N).,Ph.D.,

   H.O.D of Mental Health Nursing Department

   C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Sciences,

   Pasumalai, Madurai – 04

9. Mrs. Vijaya Suresh. M., M.Sc(N).,

   Assistant Professor in Medical-Surgical Nursing Department

   C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Sciences,

   Pasumalai, Madurai – 04

10. Mrs. Anbu Roseline. A., M.Sc(N).,(Ph.D).,

    Assistant Professor in Medical-Surgical Nursing Department

    C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Sciences,

    Pasumalai, Madurai – 04

11. Mrs. Jeya Jothi. P., M.Sc(N).,

    Assistant Professor in Medical-Surgical Nursing Department

    C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Sciences,

    Pasumalai, Madurai – 04

12. Mrs. Pricilla. K., M.Sc(N).,

    Assistant Professor in Medical-Surgical Nursing Department

    C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Sciences,

    Pasumalai, Madurai – 04

13. Mrs. DhanaPriya.G., M.Sc(N).,

    Lecturer in Medical-Surgical Nursing Department

    C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Sciences,

    Pasumalai, Madurai – 04

14. Mrs. Sasikala. P., M.Sc(N).,

    Lecturer in Medical-Surgical Nursing Department

    C.S.I. Jeyaraj Annapackiam College of Nursing and Allied Sciences,

    Pasumalai, Madurai – 04

RESEARCH TOOL

I. Demographic variables

1. Age in years

a) 20-30

b) 31-40

c) 41-50

d) 51-60

2. Gender

a) Male

b) Female

3. Educational status

a) Illiterate

b) Literate

4. Income (per month)

a) 1000-4000

b) 4001-8000

c) 8001-12000

d) Above 12000

5. Marital status

a) Married

b) Unmarried

6. Occupation

a) Coolie

b) Private employee

c) Government employee

d) House wife

e) Retired

II. Clinical Variables

1. Personal habit of

a) Smoking

b) Alcoholism

c) Both smoking and alcoholism

2. Known history of

a) Pulmonary infection

b) Neurological disorder

c) Systemic infection

3. Glasgow coma scale

a) 13-15

b) 8-12

c) Less than 8 (<8)

4. Use of anesthetics drug

a) Relaxant drug

b) Sedation drug

c) Both relaxant and sedation drug

5. Group of antibiotics receiving

a) Narrow spectrum

b) Broad spectrum

c) Both narrow and broad spectrum

6. Administration of prophylactic drug for peptic ulcer disease

a) Sucralfate (Antacid)

b) Pantoprazole (proton pump inhibitor)

c) Ranitidine (H_2 receptor blockers)

7. Type of diagnosis

a) Neurologic disorder

b) Respiratory disorder

c) Trauma

d) Cardiovascular disorder

e) Poisoning

f) Others

8. Reason for intubation

a) Respiratory failure

b) Airway protection

c) Hemodynamic instability

9. Type of intubation

a) Emergency intubation

b) Elective intubation

RISK ASSESSMENT TOOL FOR VAP

S.No	PARAMETERS	NORMAL FINDINGS (0)	DEVIATED FINDINGS (1)
I.	**Temperature (^{0}F)**	Less than 99^{0}F (<99)	More than 99^{0}F (>99)
	Tracheal secretion	Nil or rare	More with or without purulent
	Leukocytes count(mm^3)	More than 4,000 and less than 11,000 (>4,000 and <11,000)	Less than 4,000 or more than 11,000 (<4,000 or >11,000)
II.	**Glasgow coma scale**	More than 8 (>8)	8 or less than 8 (≤8)
III.	**Respiratory rate (breath/min)**	12-20 breath/min	More than 20 breath/min (>20)
	Respiratory pattern	Normal respiratory effort	Rapid breathing, breathing with use of assessory chest wall muscles
	Breathing sound	Normal breath sound	Wheeze or crackle
	Spo$_2$ (%)	90 or more than 90% (≥90)	Less than 90% (<90)
	ABG Analysis (Pao$_2$)	More than 240 mmHg (>240)	Less than 240 mmHg (<240)
	Fio$_2$ level (%)	60% or less than 60% (≤60)	More than 60% (>60)

SCORING KEY

0: No risk

1-3: Mild risk

4-8: Moderate risk

9-10: High risk